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I have never seen man in any condition that I didn't recognize in him a spiritual creature. That means much, because when this Air Age comes of age, and when we are able to bring into propinquity—practically and in volume—that which we are doing only fragmentarily today, it will be good to know that the potentialities of humanity, as one brotherhood recognizing one brotherhood, exist.

GILL ROBB. WILSON,
Aviation Editor, New York Herald-Tribune,
Through Phi Delta Kappan, Sept. 1949, p. 17.

AIMS AND ENDS OF THE PREDENTAL PROGRAM[1]

J. W. ASHTON, Ph.D.,[2] *Bloomington, Indiana*

I have been interested in the problems of pre-professional education, since the days when I used to teach freshman English composition to the large numbers of premedical and predental students at the University of Iowa. In those days, I found many times that those groups of students were the ones who had the most difficulty in seeing what the usefulness of the course in English composition might be to them. They were anxious to get on with their clinical work.

Things have changed greatly since then, but it is still important for us to consider periodically this question of what is involved in pre-professional training because it is generally true that none of the educational questions which we have to meet and which we do discuss so often are ever really settled. There isn't one way, a single way, in which the educational needs of our society can be met. And the most fruitful educational policy that can be followed is one of constant questioning, one of constant experimentation; so I hope you will understand that what I say this morning is not designed in any sense to lay down some laws that I feel are immutable; not even to set up some principles that I would defend as unchangeable in any sense; but rather what I would like to do is to discuss very sketchily what seem to me to be some of the principles which must guide us in our concern for pre-professional education and specifically, for predental education.

We have to view this whole problem of pre-professional education with some understanding of the background of professional training as it has developed, particularly in this century. Some of the older members of this group, I am sure, remember the time when formal education for the professions was not required. You can recall a time when reading for the law in a lawyer's office, or making trips and reading with a physician or association with a dentist was the major part or all that was required of the future member of the legal, medical, or dental profession. The fact that a particular kind of skill was necessary for the dentist has meant of course, that that skill has had to be developed under very careful auspices. But, by and large, until about the beginning of this century, the emphasis in the training for the professions was on the strictly *applied training* which one obtained under the direct supervision of a

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[1]Delivered at the Annual Meeting, March, 1950, French Lick, Ind.

[2]Dean, College of Liberal Arts, University of Indiana, Bloomington, Indiana.

member of that particular profession, and there was little concern for other factors in his training.

Since that time, however, there has been extensive development of educational standards and an ever-increasing number of accrediting agencies designed to enforce the standards and to consider new ones. Today we have a most curious list of accrediting agencies springing up in such profusion that the educational institutions themselves, particularly the Association of American Universities, feel moved to consider this question of accrediting agencies and their interests and their work; their influence on the colleges and universities' curricula and their educational attitudes. As a natural part of this attempt to gain greater effectiveness, there developed also the idea of the combined degree, in which the future member of a profession was exposed at least for some time to general courses before he went into the strictly applied work which constituted the direct training for the profession in which he was interested.

Complete uniformity has not been achieved. Students may enter dental school with as little as two years of collegiate work completed, or they may have received three years or an A.B. degree. It is essential, then, that we consider the relationship of the predental work to the work done in the dental school. Inevitably that leads to the question of the content of the courses in the predental program. Three functions of such work may be readily identified.

The most obvious of these, the one most frequently mentioned by dentists themselves, is the acquisition of certain technical information. Dental educators are well agreed that the prospective dentist needs to know some of the basic principles of physics. He must have some general acquaintance with the field of chemistry and somewhat more specialized knowledge in the field of biochemistry, since he will be expected to build on this knowledge in his later work. As a corollary to this, he will need sufficient mathematics to function effectively in those courses.

Secondly, as a preparation for his dental work, the student needs to master certain skills which are basic in all the work that he will do. One of these is already implied in what I have just said. He must learn to work in a laboratory, to be able to manipulate the various kinds of apparatus, to establish a particular kind of manual skill and dexterity which it will be important for him to possess not only as a student in the dental school, but also in his practice all the rest of his life. More than that, he needs to develop an understanding of what laboratory work means in terms of carefulness and accuracy. Sometimes there are other skills acquired. In some institutions the predental students are given

training in free hand drawing, for instance; in some, work in zoology or anatomy may be expected. There is general agreement on the need for skill in writing our native language correctly and with at least a reasonable degree of effectiveness.

Far more important than either of these two functions, however, is the third, the development of understanding and judgment and of the capacity for making for oneself a full and rich life. We want our dentists of this and succeeding generations to be individuals who will enter thoroughly into the life of the society, the life of the community in which they live. And this, the least tangible, the most difficult of definition, is in many respects for the dental student and the future dentist, the most important aspect of his predental work.

There are certain problems in connection with these three functions. Even the so-called skill courses and the information courses certainly have their problems. Particularly in such cases we tend to consider them on the basis of habit, or vague assumptions that we are, by requiring courses in science, developing a scientific outlook. I would suggest that one of the most important functions of a group such as this is to engage in a careful and continuing and thorough-going study of the elements of this type of predental education to assure itself again and again that what it is requiring in these fields is really needed by the student who is going into dentistry.

As I say, the answers of tradition are often unconsciously given and often the answer has very little real relationship to the current status of the profession and to the real needs of the students. All too often a professional group sets up a general requirement of a particular course designed for general education only to follow it shortly by a second request that a special section be set up for this pre-professional group because after all, what they are learning in the general course doesn't very well fit their needs. That in itself is usually an indication of some kind of premature limitation of interest and function, some kind of misunderstanding of student need. I make no pretense that I have any final answer to these problems, but I do suggest they are problems which in view of the expert knowledge which you members and teachers of the profession have, it is well constantly to consider which and how much work in skills and techniques should be required of those in the premedical curricula.

How much science does the dental student need? What kind of science does he need? How does the science which he takes fit in with the other interests, the other needs of the student? Those are questions

which I think must be answered, must be raised frequently to see whether the basis for the answer is changing with the development of new techniques, new specialties, and new interests in the profession.

I am, however, primarily concerned with the third aspect, the third function of the premedical training, the use of the liberal studies as an integral part of the whole pattern of dental training. I want to emphasize particularly this point, that these studies are or should be an integral part of the whole pattern of dental training. We are coming to see more clearly all the time that we should not try to set up here on one side a little block of courses that have to deal with the amenities of life, if you will, with making a person what we used to call, in a rather derogatory sense, a cultured gentleman, and on the other hand, a series of very practical courses which have to do with the training of the individual as a skillful practitioner in his profession. Not at all. It is one of the great tragedies of American education, the fact that such a dichotomy has existed for many years between so-called non-professional and professional training.

The real functions of pre-professional education can be conserved only as we ourselves grow to a fuller understanding of the relationship of each activity of the student to all the other things that he does, and as we come to see the liberal studies not as things apart from the students' professional interests, but rather as integral parts of those professional interests.

I would like to suggest first of all, that in the pre-professional program, liberal studies are not to be confused with the acquisition of skills, as they sometimes are. Obviously, a hard and fast line cannot be drawn. I am often impressed, for instance, by the statements men in many of the professions make about the status of English composition. As it is sometimes taught, it can be a really liberalizing subject. I suspect, however, that in the experience of some of you, it was far from being a liberalizing subject. It may have been, perhaps through sheer necessity, a pretty severe kind of drill which involved simply the acquisition of certain basic skills such as spelling, correct punctuation, and the writing of complete sentences, but it didn't get far beyond that. While a course in English composition can be an opportunity for the student to come into contact with good writing by other people, to learn to express himself, and to find a way to fulfill that creative urge which lies within each of us, yet by and large, it must often be classified with the skills courses.

I think if we want to concern ourselves directly with the problem of the function of liberal studies, we ought to consider for a moment what we are thinking about when we speak of educating dentists. What does

the term, the profession of dentistry, mean? Does it mean only the production of individuals who are skillful in one or many or perhaps all of the professional aspects of dentistry? Often it does not. Indeed, I suppose it never really means that. It means that trained men and, in a few instances, women, are being sent out from our dental schools to communities all over the country where by reason of the very fact they have a professional title and a position of professional importance in the community, they are inevitably going to be looked to for a kind of community leadership which the mere acquisition of skills will not give them. There are relatively few practicing dentists, I suppose, who are able to spend all their time only in the practice of their profession. Even if there are many who do, the fact remains that they should not be doing only that. It is, I think, true that often in community life, professional men and women do speak up more vigorously, and more intelligently, and more effectively than other educated people do, especially concerning those principles which lie at the very foundation of our public and civic life.

We cannot hope that the aspects of American democracy which we cherish most: the sense of sound responsibility for the general welfare; the sense of freedom to speak and to understand the general problems of the nation as well as those of our local communities, can be appreciated or maintained unless the people, particularly those with professional education, take an intelligent part in the leadership of that community in which they live.

This matter of community leadership cannot be overstressed. But there is also the necessity for development of the kind of objective attitude which frees the individual, at least in part, from prejudice. All of us have our pet prejudices, but a proper education can give us that freedom from the limitations of those prejudices that grow out of lack of understanding, or that grow out of preconceived notions based on limited information, half truths, or mistaken "facts."

There is still another phase of this issue, one that is personal rather than social: the need for personal development. What kind of a man, what kind of a person is the dentist to be himself, when he is with himself? Will his sole recreation be sitting before the television tube all evening with not much to occupy his mind beyond the image on the screen? Is he to be a person of limited interests, limited capacity for experiencing the great breadth and wealth of enjoyment and understanding which the world we are living in offers, or is he to be the kind of person who can live a rich life himself from his own educational inner

resources? These are the issues with which we are primarily concerned in the matter of personal development.

Intelligent participation in public life is a matter of first importance. There are examples all around us, and as we see the freedom with which a McCarthy makes a spectacular and, as is increasingly apparent, baseless charge against people in public life, we cannot but be concerned with the need of individuals who have some understanding of public affairs, of the basic patterns of relationship between this country and other nations, and indeed, some concern for the fundamental problems of fair play.

There is another aspect which professional people generally must consider very carefully and for which they must have a sound and adequate background. I am impressed many times by the comments that I hear, especially from medical friends, about the bills that have been in Congress concerning the development of medical health plans—socialized medicine, so-called. Now I am not planning to discuss the usefulness or the danger of federal health insurance. That is not my concern. What I am concerned with, however, is the fact that so much of the discussion of this subject has two characteristics. One is that it is dismissed simply with an angry and contemptuous gesture as communist propaganda. But the problems of socialized medicine are not to be answered or not to be met by that kind of angry and contemptuous gesture. In the second place there is a tendency to insist that we ought not discuss such a question because anybody who discusses it lays himself open to suspicion. It is that kind of narrowness of view that presents a grave problem in predental education. The very essence of our way of life is the insistence on the importance of discussing whatever may be of significance in the life of the people and of discussing it fully and honestly and understandingly. It is only through such discussion, based on careful consideration of all the available information, on the fullest understanding of both the immediate and long range issues involved that this or other problems can be met in a democracy.

On a much broader scale, predental education must offer understanding of the implications of what we call the atomic age. What does the atomic age mean? As popularly understood it means the development of atom bombs and hydrogen bombs, with very little reference to, and with very little interest in the great fundamentally important fact that atomic fission may offer us far more of good than of evil if we make use of it wisely and well. The atomic age need not be a synonym for destruction; it could be, properly conceived and, with proper use of the information that we have, a new era of rich and humane development.

This emphasizes what I mentioned earlier, the importance of the integration of the various aspects of the dental student's training. His predental science is not required solely for the development of a skill which will be useful to him in his professional work. The work which he has in physics for instance, if it is not made a specialized little course of physical principles for people who are going into dentistry, can be a course which will give a richer understanding of the whole world in which he is living, a real introduction to the atomic age.

What does all this involve then? First of all, it means the ability to read critically and with pleasure. I would emphasize critical reading as that done with an attentive mind, that sees issues as they are presented, but that does not believe everything that is in print just because it is in print. We need professional men and women who do not depend on a newspaper columnist for their ideas, for whom the gospel according to Pegler or Pearson or any of their ilk is suspect if it does not agree with the facts as they may have been ascertained.

In the second place, it is useful and wise and helpful if students develop a sufficient sense of history to put the present, their own daily lives, in a true and proper perspective. There are few things more pathetic than the spectacle of the person who sees each day's events only as things in themselves, without relationship to what has gone before and for whom every new tragedy, every new benefit, comes as a complete surprise because he has no sense of the way in which these things develop and fit into the course of historical events. It is important in the development of predental education that we help students to see something of that continuity of experience which perhaps more than anything else proves so clearly that we are not alone in our own time and that what seem to be the tragedies of our time are, to some extent, reflections and sometimes duplications of the mistakes and the mischance of previous ages.

In the third place, I would suggest that the predental student, like any other student who has to take an active and important place in society, have some acquaintance with at least one culture other than his own. Whether he gets it through the acquisition of a foreign language; or whether he gets it through the study of the history and the sociology and the anthropology of other cultures, he should have a realization that the pattern by which he lives is not the only possible pattern.

We ought to give students in the predental program some idea of the fact that society does constantly change, that one of the important laws of life is change, and that as soon as life stops changing, death takes place. Again, it seems to me that the interrelationships between this and the work he is doing in the scientific laboratories is clearly to be seen.

Along with this ought to go acquaintance with contemporary social and economic theories. I would suggest, for instance, that the predental student should know some economics, not in order that he might keep a satisfactory set of books when he is set up in business, or keep out of the hands of the income tax collector insofar as it is possible for anyone to do that, but rather that he may know something about the principles on which income taxes are levied, and what his relationship and responsibility to the whole plan of our government are.

Perhaps as a result of these things, and as a final integrating factor, we should expend all the effort that we can to develop in the student an ability to distinguish between theory and fact. He should realize that the number of facts at our disposal is very limited, and that as a result many of our conclusions must be tentative. He must learn to recognize that when we are dealing with theories, there is need for the recognition of change, and for the adjustment of one's ideas to these theories. There is also the adjustment of theories to changing conditions, which is one of the most important aspects of one's experience.

This represents a very real problem for the arts colleges. I am not implying that the arts colleges are prepared to do all this job perfectly. The arts colleges, like the schools of dentistry, the schools of medicine, and the other professional schools, are going through and have been going through ever since the first world war, a series of changes and adjustments marked by periods of confusion and misunderstanding of their own functions and purposes. I would not insist that all arts colleges even for their own candidates for the A.B. degree, succeed always in attaining these ideals which I have set up as a part of the program of the dental student.

Our work is often characterized by specialization which comes too early, so that even the introductory course is treated by the teacher as if all are going to be specialists in that field. The arts colleges themselves have a real responsibility in providing the integration of the various fields of knowledge so important to the student. He must learn to see life as a whole, not as disparate parts. A degree must be something more than an amassing of so many credits in English, so many credits in chemistry, so many credits in physics and so many credits in psychology or whatever it may be.

The arts colleges are studying this problem, but it is still one of very great seriousness because of the tendency within the arts colleges, since the first world war, to split up the subject fields into more and more courses, with an increasing emphasis on specialization.

Finally, the arts colleges must show, as many of them are now showing,

a willingness to experiment in their curricula. To do this we need more and more of the spirit of cooperation and understanding between the faculties of the professional schools and the faculties of the arts colleges so that we may work out together those common bases of understanding, those common bases of educational development, which will produce through the professional schools not only people who are adequately, indeed, expertly trained in the area of that profession, as chairside practitioners, but professional men understanding the relationship of their professions to all the other fields of knowledge. They should have a feeling of community responsibility, of the need for personal development, and through it all the fulfillment of one's personal aspirations and interests.

Working in harmony with each other, the faculties of the dental school and of the college of liberal arts can develop an integrated plan of education which is fundamentally sound, because it will produce for society a finer type, a more richly educated, a more fully responsible individual, both as a member of the profession and as a member of his community.

"A man who is turning out careless, imperfect work is turning out a careless, imperfect character for himself. He is touching deceit every moment, and this unseen thing rises up from his work like a subtle essence and enters and poisons his soul."—HENRY DRUMMOND.

THE TEACHING OF ENDODONTIA

(Herewith are submitted two papers on the above subject, one as an integral part of Operative Dentistry, and the other as an integral part of Oral Pathology, each with one discussion. These should be read and considered as methods of approach that a better understanding of the subject may be obtained by the student.—Ed.)

1. AS AN INTEGRAL PART OF OPERATIVE DENTISTRY

LESTER E. BREESE,* D.D.S., *San Francisco*

It should not be assumed by the title of this paper that an attempt is being made to set a pattern for the teaching of endodontia. A dental curriculum is not a flexible unit which can be reorganized at will without disrupting many factors which enter into a good teaching program. Courses of study could be and probably are quite similar, but the means by which they are taught vary considerably.

A short résumé of one of the activities carried out by the American Association of Dental Schools should make a more understandable approach to our subject. In 1935 the Curriculum Survey Committee made a report which comprised a course of study in dentistry.[1] The arrangement of subjects submitted as a guide for the dental schools included the opening, cleansing, and filling of root canals under oral medicine and the suggestion was made that it be taught in the second year. For the third year, it was recommended that a section under the same division be devoted to the treatment of diseases of the dental pulp and periapical tissues, including a *review* of classification and definitions, etiology, pathology, local and general symptomatology, as well as diagnosis and prognosis, tentative and final. Anatomy of root canals was also to be reviewed. Oral anatomy and oral pathology were the recommended courses through which the *reviewed* work might be made. The clinical practice in abnormal conditions of the dental pulp and periapical tissues was to be conducted under oral medicine also. The outline suggested for preclinical and clinical instruction was presented in detail and might well serve as an excellent aid in organizing our lecture material.

The course outlines suggested by the committee were well received but the placing of the endodontic section of study under the division of oral medicine apparently did not meet with favor. Two factors influence the writer in believing there was a diversified opinion among schools relative

*Assistant Professor of Operative Dentistry, Chairman of Endodontia Section, University of California, College of Dentistry.

[1]Report of Curriculum Survey Committee: Course of Study in Dentistry, American Association of Dental Schools, 1935, pp. 254-257.

to the division within which such a course of study should be conducted.

The first indication was brought out in October, 1940, when the Council on Dental Education of the American Dental Association adopted the "Requirements for the Approval of Dental Schools."[2] Under the subjects listed, operative dentistry was to include periodontia and pulp canal therapy. This could well imply that the teaching of endodontia was either not feasible or was impracticable under oral medicine. The time from January, 1941, to September, 1942, was stipulated as a period for the schools to study the requirements, confer with the council, and make such adjustments as were deemed desirable.

Secondly, the report given on the survey of dental schools by this same body in 1944,[3] produced further evidence that the schools must have varied considerably in their selection of a division for the teaching of this subject. Of 38 schools, 13 included endodontia under operative dentistry. The number mentioned might make the percentage seem low, but the remaining 25 schools taught the course under several different headings. Information recently gathered by the writer from 32 schools out of a possible 44 reported 11 are at the present time teaching endodontia under operative dentistry and the remainder under some 12 diversified departments or divisions. Of the 21 schools referred to, six taught the course under endodontia; five under oral medicine and one school each under the following headings: oral pathology, periodontology, oral surgery, therapeutics, dental medicine, clinical dentistry, oral pathology, diagnosis and therapeutics, medicine, materia medica and therapeutics, and oral pathology and periodontia.

Since the Council on Dental Education has spent much time and effort in making surveys—analyzing them and making recommendations, should our dental faculties not then accept their recommendations and teach endodontia as an integral part of operative dentistry?

Since this arrangement has been a working plan at the University of California, College of Dentistry, for approximately the past 10 years, it would seem logical that such could be used as a basis for discussion. As a supplement to this study, material will be used which was recently gathered from a questionnaire sent to dental schools in the United States and Canada. An outline of our present scheme, in chart form, should be an aid in clarifying some of the course objectives. (See Fig. 1, p. 62.)

Any curriculum in dentistry is dependent upon certain preclinical

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[2]Council on Dental Education Requirements for Approval of Dental Schools; *J.A.D.A.*, 28, 151-156; 1941 (Jan.).

[3]Council on Dental Education: Survey of Dental Schools, American Association of Dental Schools, vol. 21, p. 204; 1944.

courses, most of which, in the majority of dental schools, are taught in the first two years. These can, for the purpose of better understanding, be divided into three categories, namely, preclinical sciences, basic technics, and specialized technics.

Under our preclinical science division is taught: general anatomy, pathology, physiology, pharmacology, bacteriology, and bio-chemistry. Subsequent to these, a combined course of oral histology and oral pathology is given, under which a correlation of the above mentioned subjects is made. Thirty-four hours of this course are devoted to the pulp and periapical tissues. With this background, the student should have a basic knowledge sufficient for application in clinical use. It would, however, be a misconception on the part of the instructor, if he expected the student to make an application of his learning without first forming for him a bond between the preclinical sciences and clinical practice. Due to the highly technical nature of dentistry, students enter college with the preconceived idea that their training will be primarily in the restorative field, and that their entire success will depend upon their digital skill. If the scientific principles taught are to be retained and

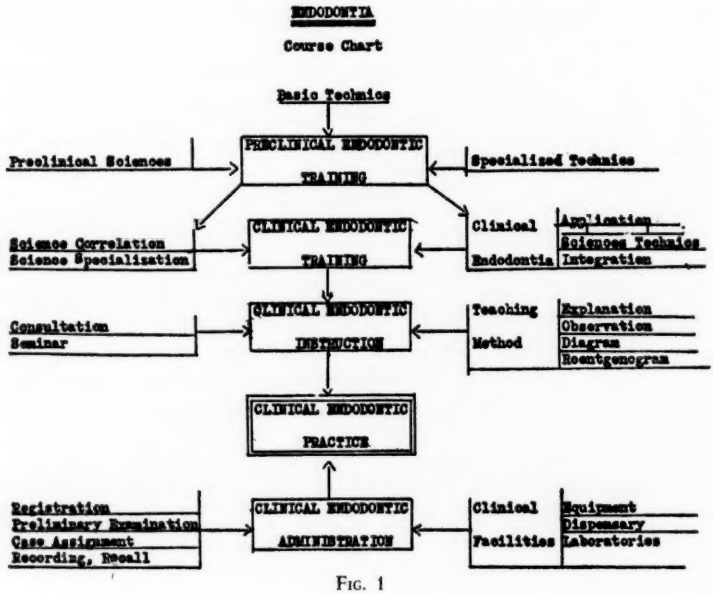

FIG. 1

applied, teachers in oral histology and oral pathology should give lectures which are not only instructive but also motivating. No other preclinical course is of more value in making a final diagnosis in clinical practice of interdependent subjects. As a result of this inter-relation, it has been the policy of the operative division to provide clinical instruction by men from these courses who serve on the various staffs of sections under operative dentistry.

The second category, basic technics, is not a division of our preclinical sciences, but one to which a mythical heading has been given and includes any division or section that embodies some basic training pertinent to endodontia. In the first year, a course on dental materials, covers the fundamental principles of physics as applied to those substances used in the dental curriculum. With such an indoctrination, the student is taught the manipulation of all materials necessary to dentistry, but is not given specific training for individual courses. Concurrent with the course on dental materials, a course is devoted to tooth morphology. Although the latter is not truly a technical course, great emphasis is placed upon the digital skill of the student. Dental anatomy is taught by lecture and the learning expressed on actual size wax carvings of entire teeth, comprising one-half of the upper and lower dentition. Approximately eight hours are devoted to the study of pulp cavity morphology and the relation of the pulp cavity to the crown and roots of the tooth. The carving of the roots, keeping the relative shape of the pulp cavity in mind, is most applicable to endodontic teaching.

The basic technics of anesthesia are taught in the first semester of the third year, under the division of dental surgery. During the last semester of the third year, instruction in a technic course under the section of roentgenology, is obtainable. This is optional training and has no particular value in the teaching of endodontia. The evaluation of properly taken roentgenograms will be referred to elsewhere in this paper.

The heading for the third category, specialized technics, pertains to those subjects of the second year which, either by lecture or laboratory, relate to and train the student in definite procedures which will subsequently be used in clinical practice. A syllabus, provided each sophomore student, covers an outline of pulp cavity morphology and the technical procedures in endodontia. The practical application of this material, consisting of the opening, preparing and filling of the pulp cavity, is taught under operative dentistry and follows the laboratory technics done in caring for the coronal cavity. The student is required to complete the above mentioned operations upon an upper and lower central incisor, a two-rooted upper first bicuspid and an upper and lower first molar.

Two additional molars are impregnated with silver nitrate. Upon the completion of each pulp canal filling, the tooth is cut longitudinally through the center of each root. By so doing, the student may judge the efficiency of his operative procedure and at the same time make a study of the canal morphology. The upper and lower molars which have been treated with ammoniacal silver nitrate and eugenol are also sectioned for examination. The pattern made will indicate how well the drug has been applied and likewise reveal the depth of penetration into the dental tubuli. These exercises are designed to develop the student's skill and also give the student an opportunity to evaluate his own performance. Twenty-two and one-half hours are utilized for this training.

It is in this course that the correlation of our preclinical sciences with our preclinical technics begins. The student for the first time is required to draw upon his knowledge of dental anatomy, histology, and pathology in order to form a basis for a technical procedure within a tooth cavitation. Whether the void involved is developmental, as in the case of the pulp cavity, or one created by a caries process seems immaterial. Each or both, whichever the case may be, must be treated. The cavity preparation due to caries is merely a step which must precede that which may follow. The dependent nature of such operations and their relation to clinical practice calls for instruction from well qualified teachers. To attain such proficiency, it has been the policy of the division of operative dentistry to place their staff in both preclinical and clinical service whenever possible. This arrangement has produced gratifying results. A more uniform basic instruction is maintained with much less confusion upon the part of the student. Other specialized technics pertaining to endodontia such as periapical currettage and apicoectomy are taught under dental surgery.

The clinical teaching of endodontia is introduced within the division of operative dentistry during the first semester of the third year. Six hours of lecture are devoted to the clinical application of the correlations evolved from the preclinical and technical sciences. These lectures include information pertaining to conditions of the dental pulp and tissues of the periapical area. Their etiology, symptomatology, diagnosis, and therapy are discussed. The blackboard and projected slides are used to emphasize technical procedures. The projection of a series of roentgenograms of cases completed by former students not only instructs but promotes enthusiasm as well. A syllabus supplementing the lectures is supplied the student at the beginning of the course. Emphasis is placed upon *examination and diagnosis, the selection of cases for treatment* and

clinical procedures. Reading references are assigned from textbooks and the current literature.

Concurrently, lectures are given in oral pathology under the division of preclinical sciences, which have been referred to under that heading. Roentgenology, under its own section, is also taught at this time as a required course which covers the reading and the interpretation of roentgenograms. It is estimated that, of the latter, approximately seven hours are devoted to conditions pertaining to the pulp and periapical areas of teeth.

Although the junior student is frequently permitted to carry on practical cases in pulp canal therapy during his first semester in the clinic, he is not too well prepared to do so. Aside from an incomplete coverage on clinical procedures he has had insufficient experience in placing the rubber dam and the administration of local anesthetics. Would it not be better to devote a more concentrated effort to three semesters for the fulfillment of his requirements in clinical practice? With a better background, the student would proceed with a more intelligent understanding of the clinical instruction offered by the endodontic staff. It has been estimated that thirty clock hours of pulp therapy on three teeth would satisfy the clinical requirements, provided a thorough preclinical schooling was obtained prior to being assigned cases.[4] Each member of our last nine graduating classes spent an average of 9.5 clock hours, with an average of 2.67 teeth treated. If these figures can be accepted as a fair sample upon which to base clinical practice in endodontia, then our quota might seem low. It is our policy to try to attain the experience of treating one molar and two teeth anterior to the molars; but, due to a lack of suitable cases this cannot always be done. As an example of distribution, the classes above referred to completed therapy on 2.75 times as many teeth anterior to the molars as they did molars. Only 69 per cent of the students were able to obtain molars for treatment. Information gathered from the author's survey showed considerable variation in the requirements for clinical practice. Of the 32 schools which reported, 25 required a specified number of cases to be treated. These ranged from 1 to 12 and averaged 4.16. Six schools did not stipulate either a fixed or an approximate quota. One school required 75 hours of clinical endodontic practice.

Teaching methods play a very important part in student learning, especially in a minority section. Due to the small percentage of alloted time, every effort should be made to so organize the course that the

[4]Grossman, Louis I.: The Role of Endodontic Teaching in a Dental Curriculum; *Journal of Dental Education, 10, 25; 1945* (Oct.).

subject matter can be read quickly and understood easily. Any syllabus which is given to the student should also be made available to the endodontia staff. Such information and occasional group meetings will be of material assistance in standardizing teaching and save on clinic hours. New staff members are encouraged to attend all lectures pertaining to endodontia. The teaching of clinical endodontia and operative dentistry are quite similar in many respects due to the anatomical proximity of the area to be treated. The metohds employed short of a pulp exposure are identical in either field. It should require very little study on the part of an interested instructor in operative dentistry to prepare himself for special tutoring. Members of the endodontia staff are responsible for the student's activities in this phase of work for the teacher's assigned period. The necessity for pulp canal therapy may occur due to some unforseen condition or accident while rendering operative or crown and bridge service. Should this be one of the circumstances by which treatment must be instigated, the case can be undertaken immediately without referring to another clinic or waiting for a future appointment. The divisions mentioned share the same clinic, with overlapping schedules. Whether the problem arises while the student is operating under either division, makes no difference in the instruction received, for, as previously stated, one member of the operative staff is designated to give special instruction in pulp canal therapy each period. Collaboration with the section on dentistry for children is often a timely convenience. The dual use of thoroughly trained instructors under operative dentistry is an aid which shortens the time needed for the student to complete an operation. The nearer we approach the elimination of a waiting period for the student prior to securing a continuation check, the nearer we approach individual instruction. This arrangement is sound in principle and a great time saver to interdependent divisions or sections.

Another definite advantage of a combined clinic is noted when a question arises which may call for a consultation. A student may be preparing an abutment tooth for a bridge and while doing so, accidentally expose the pulp. Immediately many leading questions must be answered. Should endodontia be attempted? If so, would it be better to cap the exposed dental pulp, or extirpate the same? If either operation were performed what would the prognosis be? Answers to these questions could be given without delay and some decision made.

Let us then suppose that in the operative division, upon examination, a tooth is indicated for pulp canal therapy. The case is assigned, but upon examination by a member of the endodontia staff, some doubt arises as to the indication for treatment. If the tooth is sacrificed, can a

successful bridge be placed? Again, a short discussion may readily establish the procedure to be followed. The student is always included in these discussions, thereby securing additional experience in handling problems which may arise later on in private practice.

There are instances when a condition apparently idiopathic may be presented. In such cases, an opinion from the section on oral diagnosis and the division of dental medicines is solicited. These branches are conveniently located immediately adjacent to the operative clinic. If a conference with the orthodontic or denture division is deemed advisable, it may be necessary to make an appointment, due to the differences in schedule. Cases which are unusual in any respect may be presented at one of the weekly seminars for discussion. These are attended by members of the faculty and senior class. Such phases as diagnosis, treatment, and results following treatment, are considered and evaluated.

It should be of interest at this point to introduce the query in the questionnaire, "How is consultation arranged for with other clinical divisions?" Seven schools made reference to some form of preplanned treatment executed by a planning board or similar body. Ten schools consulted department heads as the need arose, and three depended upon oral daignosis for a final decision. Another school placed the responsibility in the hands of the students. Twelve schools did not answer the question. Due to the possibility of rapidly changing conditions occurring within the pulp, it seems that any tentative plan of treatment must therefore be temporary and looked upon as a presumptuous guide. Any appreciable elapse of time between the preliminary examination and the operation would call for a re-evaluation immediately prior to any therapy. In the essayist's opinion, this period of re-evaluation would be the most opportune time to hold a consultation. Under the division of operative dentistry with all the related sections in the immediate environs, we have an excellent opportunity for a conference which can be conveniently and thoroughly executed without loss of valuable time.

Our endodontia staff is made up of men who are clinical teachers of operative dentistry and have an interest in one or both of the subjects, endodontia and periodontia. Members of oral pathology, preclinical sciences, and others from specialized fields serve under operative dentistry, and are included in the group. The chairman of the section gives the lectures on clinical endodontia and is responsible for the administration of the course. With such a combination of teachers, there is an excellent opportunity for an exchange of knowledge and ideas which should be most inspiring to the interested dental educator. Clinical investigation is encouraged and many times, greatly aided by the co-

operation of the College of Pharmacy and the School of Medicine, both of which are located on the campus.

The enthusiasm, knowledge and skill of the teachers are the factors which are reflected in the student's learning and may well determine his degree of success. The time consumed by teaching methods which are employed in the clinic should be as brief as possible, but thorough. A correlation with the preclinical sciences and technics must not be overlooked. The Council on Dental Education observed that such an interchange was generally low.[5] This was, in most instances, attributed to a lack of teachers with adequate preclinical science training, and heavy teaching schedules. The syllabus on clinical procedures is invaluable to the student and will assist him in routine operations. If a problem arises which is unusual and calls for additional aid from the instructor, then information is learned by explanation, observation, diagramming and roentgenogram interpretation.

As previously mentioned, successful operation in endodontia is dependent upon a preclinical science background, technical training and correlation with clinical practice. But before such can be accomplished, all the principles which pertain to surgery must be considered and applied. Although every phase of the endodontic procedure is covered in the syllabus it is felt that special emphasis should be placed upon asepsis, instrumentation and the pharmacology of drugs. Such precautionary measures are called to the student's attention when beginning his first case.

Preparatory to this, the student's first responsibility is to put into practice that which he has experienced in the operative dentistry clinic. The administration of anesthetics, the placing of the rubber dam, the cavity preparation, and the placing of filling materials for future protection in the treating of the canal, are only a few of the prerequisites necessary for successful endodontics. These are so inter-related in proximity, technic, and the facilities required, that the endodontic procedure cannot be separated from them.

The Council on Dental Education showed in its survey that there was a great deviation in the percentage of the whole curriculum which was assigned to all clinical courses. Endodontia was found to be as follows: High, 4.10 per cent; low, .34 per cent; with an average of .91 per cent.[6] If we were to transpose these figures into clock hours on the basis of the maximum allotted, 4400 hours, then the following would result: High 180.4 hours; low, 14.96 hours; with an average of 40.04 hours. Now compare the average with the weighted value which was computed as

[5]See footnote 3.
[6]See footnote 3.

being sufficient for a well-rounded schooling in this subject. The figure arrived at by the council was 2 per cent[6] and when calculated on the basis of maximum curriculum hours, we would have 88 hours, or 48 hours more than the average dental college devotes to pulp canal therapy. This proportion denotes a 54.5 per cent deficiency in hours allowed for the course. In all probability most schools feel that more time is needed to cover the program that they have outlined, but find it impossible to obtain additional hours for the instruction. If this is true then teaching methods must be improved. A better sequence in courses prerequisite to clinical practice would seem to be in order. Data compiled from the questionnaires returned showed evidence of a high percentage of lecture work pertinent to clinical practice being given concurrently rather than just prior to entering that field. This is also a criticism of our own school and was pointed out in this paper under the discussion of teaching clinical endodontia.

From the foregoing observations and discussion, definite trends and conditions worthy of consideration appear to exist and can be summarized as follows:

1. The teaching of endodontia under oral medicine as outlined by the Curriculum Survey Committee of 1935 was either not feasible or was impracticable.

2. In a recommendation made by the Council on Dental Education and adopted in 1940, on the "Requirements for the Improvement of Dental Schools," the teaching of endodontia and periodontia were included under the head of operative dentistry.

3. A report on dental schools made by the Council on Dental Education in 1944 gave endodontia as being taught under operative dentistry in 13 schools out of the 38 surveyed. In the remaining 25 schools, the subject was taught separately under various divisions.

4. Information gathered from the 32 questionnaires received from a possible 44 dental schools in the United States and Canada, showed that 11 taught endodontia under operative dentistry. In the remainder it was taught under diversified preclinical subjects and did not indicate any contact with interdependent clinical courses.

5. Data gathered on the distribution of courses taught showed a considerable overlap of preclinical subjects in the clinical years. Those more predominant were given in the following order: pathology of the pulp; pulp canal therapy; and the opening, cleansing and filling of the canals.

6. The average available time devoted to endodontia is found to be

low. With the crowded schedules, the possibility of acquiring additional hours for more adequate training is doubtful.

7. The allotted time for clinical instruction and practice would apparently have to be compensated for by a higher ratio of clinical teachers to students and by quality of clinical teaching.

8. The fundamentals learned in the preclinical sciences should be correlated and applied to clinical technics, rather than by applying the technics to the fundamentals.

9. Preclinical sciences are basic and serve all courses of study in dentistry, therefore, it would seem that they should assist rather than direct the teaching of clinical subjects.

10. The objective of a clinical course is to direct the student in his clinical practice, making use of all his previous schooling in dentistry, thereby preparing him to cope with any problem that he might encounter in private practice.

In conclusion it may be stated that in teaching endodontia, ample instruction should be given in proper sequence by well-qualified teachers trained in closely allied courses. The pulp cavity operation, whether predetermined or confluent with caries, should be accomplished without loss of time to the patient or student. Staffing should provide instruction and consultation to the restorative branches of dentistry at all times. The anatomical proximity of field and continuity of procedure, along with the often unpredictable extent of caries are factors which intimately relate endodontia to operative dentistry. Upon these premises, this paper has been founded. It is realized that there is always room for improvement and our program is no exception; however, the satisfaction we have experienced in teaching endodontia as an integral part of operative dentistry is very gratifying.

Discussion

DONOVAN W. BROWN, D.D.S.,[1] *Chicago*

It is quite evident that Dr. Breese has given much thought to the quantitative and qualitative aspects of the teaching of endodontia. He has stressed the necessity of correlating the clinical and preclinical phases of teaching. He has considered teaching material and teaching methods and has emphasized the benefits of teacher interest and enthusiasm.

Perhaps the following factors are largely instrumental in forming our

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concept of endodontia and in influencing our procedures in teaching and in practice:

1. The quantity of endodontia to which we are exposed in the dental course.

2. The quality of the teaching material and the enthusiasm displayed by instructors.

3. Our own interest in reviewing the literature and in keeping abreast of contemporary thought, practice and research.

4. Experience.

It must be admitted that endodontia stands high on the list of the most difficult phases of dental practice. The competent endodontist must have a good working knowledge of the basic sciences and must possess a high order of technical ability if the desired results are to be achieved. In demands on time, knowledge and skill, endodontic procedure should not be placed second to any part of clinical dentistry.

Course content, proper timing and methods of presentation need great emphasis. We believe that what is taught, when it is taught and how it is taught is more important than where the course is presented.

Should we say that the primary function of a dental school should be to equip its students for the general practice of dentistry? In 1935 the Curriculum Survey Committee, American Association of Dental Schools, had this to say, "Undergraduate dental education aims primarily at preparing men and women for the general practice of dentistry."

Before discussing the assignment of endodontia to any clinical department, let us refer to some definitions, as presented by the aforementioned committee:

1. Operative Dentistry

"That branch of oral health service which deals with operations on the hard tissues of the teeth called for by caries, abrasion, erosion, hypopoplasia, minor fractures, or impaired function (not including crown and denture prosthesis)."

2. Oral Medicine

"It comprises the treatment of:

1. Diseases of the dental pulp and periapical tissues.
2. Diseases involving the gingivae and other peridental tissues.
3. Lesions of the lips, cheek, and tongue, and other diseases of the mouth which do not require surgery."

3. Oral Pathology

"The special branch of pathology that deals with abnormalities and diseases of the oral cavity and associate parts."

At our school, clinical endodontia is grouped with periodontia and the department is called "oral pathology." Oral pathology, in this instance,

is synonymous with the definition of oral medicine, as presented by the committee in 1935.

In the dental schools of today, the physical equipment and arrangement of clinical facilities are subject to much variation. The various clinical departments may occupy one or several floors. How can we rigidly standardize departments, in view of this situation? The procedures taught in operative dentistry in one school may be markedly different from those taught in another school.

Let us consider the preclinical teaching of endodontia. We like the manner in which Dr. Breese has stressed the necessity of a thorough grounding in the preclinical sciences. We admire his ability to see things from the viewpoint of the student, together with his grasp of problems confronting the teacher.

Teachers of clinical endodontia should have some part in the preclinical teaching, especially where it is definitely related to clinical practice. Those who are mainly concerned with laboratory instruction should not miss opportunities to become familiar with the many problems arising in the clinic. This sort of plan would foster better correlation of effort in teaching and in research.

Dr. Breese has presented some very good reasons for teaching endodontia as an integral part of operative dentistry. Other good reasons might be advanced in favor of teaching endodontia elsewhere. Before we integrate endodontia with any department, let us clearly define what is to be taught in that department. Let us not labor under the delusion that we can transform undergraduates into specialists in endodontia, periodontia or what not. The clinical years are too crowded to permit the realization of such objectives. We are in favor of allotting to endodontia a fair and equitable portion of the total clinical hours available to the student.

From a strictly endodontic viewpoint, where would we place the teaching of clinical endodontia? We have listed our choice on a preferential basis:

1. As a separate department.
2. Grouped with periodontia, wherever that may be taught.
3. With operative dentistry (if operative dentistry be defined according to the definition of the Curriculum Survey Committe, 1935).

In this connection, we wish to repeat the statement that we are not primarily concerned with a consideration of where the teaching is done.

No persons are better informed of the needs, or more aware of the requirements of good teaching in endodontia, than those who teach

endodontia. In the natural course of things, we should expect to look with confidence toward such a group to lead us in solving these problems.

We firmly believe that the average time devoted to clinical endodontia is too low. Proficiency cannot be acquired on the basis of a paucity of material and narrow limitation of clinical experience. Positive results are not the reward of a negative approach.

Dr. Breese, in analytic fashion, emphasizes teaching needs and teaching methods. We commend him for the quality of his presentation.

2. AS AN INTEGRAL PART OF ORAL PATHOLOGY

ROBERT G. KESEL, D.D.S., M.S.,[1] *Chicago*

The focal infection concept swept the country with great enthusiasm during the decade between 1914 and 1924 largely because root canal therapy was and had been a stepchild of operative dentistry. The local and systemic sequelae of poorly treated root canals were all too prevalent and the horrible examples were seized upon by the medical and dental professions to condemn all pulpless teeth.

The bad root canal therapy resulted largely from a lack of understanding of the tissue reactions that occur at the apices of teeth during and following treatment—reactions that are fundamental to success. There is little in the realm of operative dentistry, either in theory or in practice, that will supply the necessary concept of the biologic activity of the pulp remnants and the periapical tissue. That appreciation comes from the understanding of inflammation and its resolution and that insight is supplied by the department of pathology. The student must be made to realize that he is dealing with living tissues which respond with the same vascular, cellular and enzymatic changes, that occur in any other vital tissue upon surgical manipulation. His appreciation of these reactions is learned in general pathology and is reiterated in oral pathology. If a choice must be made between combining the instruction of endodontia with operative dentistry or oral pathology, I would select the latter in an effort to put first things foremost.

Endodontia requires a technic unto itself. It requires surgical cleanliness, the judicious use of drugs, delicate manipulation, bacteriologic guidance, as well as a filling technic different from any employed in so-called operative restorations. Each of these considerations is based on an awareness of pathology and bacteriology.

Operative dentistry, *per se*, is concerned with tooth structure and morphology, cavity formation and preparation, filling materials and their

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manipulation. The technics of operative dentistry and endodontics are not the same. Endodontia deals with the treatment of soft tissues and their attending vascular and cellular changes, while operative dentistry is concerned chiefly with the treatment of hard tissues and the replacement of lost tissue with substances of comparable hardness and contour.

The need for operative service is so great that departments entrusted with teaching both operative dentistry and endodontia are prone to direct their major effort to the development of students proficient in the art and skill of filling cavities. I do not wish to minimize the need for such training nor depreciate its accomplishment, but unless the staff is unusually well balanced, the attainment of the operative objectives relegates endodontia to a minor role. When we consider the desirability of saving natural teeth and of the health hazards attending the operation, a minor role in the curriculum is untenable.

A virtue in closely associating endodontia with oral pathology is that it provides a direct linkage between clinical practice and many preclinical science courses. The utilization of clinical teachers well grounded in fundamental science should be encouraged for the beneficial effect that it has not only in student teaching but on the faculty itself.

Teachers in endodontia can continually refer to cellular activity and to tissue response to injury and treatment thus making clinical application of what was learned in pathology. The same opportunities exist for discussions applying the science of bacteriology to the oral cavity. The culture technic used to guide root canal therapy provides one of the few direct clinical applications of a technic learned in a preclinical science course. Opportunities are provided clinical teachers for discussing physiology and pathology in connection with the drugs and chemicals used in the treatment of pulp and periapical diseases. A specific example is the application of the antibiotics such as penicillin and streptomycin to root canal treatment. Their use is closely correlated with medical research, but specific adaptations of them had to be made for root canal use. These adaptations and the evaluation of the results required investigators familiar with the properties and use of the antibiotics along with the science of endodontia. I doubt that the rapid strides that have been made in application of these new aids in endodontic treatment would have occurred if endodontia had remained a stepchild of operative dentistry. In fact, I should like to venture an opinion. It is that the great progress made in endodontia in the past two decades has come largely from those institutions that have stressed endodontia in a division separate from operative dentistry.

The student spends many hours in his preclinical courses acquiring knowledge that has great application in the field of endodontia. Therefore, endodontia deserves emphasis in the dental curriculum; its deemphasis is a waste of opportunity for correlating the preclinical and clinical sciences. The lack of emphasis that has been placed on root canal therapy in many institutions may well be a reason for the complaint too frequently heard that senior students are ignorant of so many basic facts. The blame is usually placed on the instruction in the preclinical courses, but is that where it really belongs?

The subjects that provide the basic knowledge for root canal treatment provide excellent opportunities for graduate study. Instructors cannot overlook the challenge that exists in the necessity for expanding the frontiers of information in endodontia as related to these basic fields. If the instructor is adapted to a teaching career, he will not ignore these opportunities. Eight of the instructors in the department in which I am presently teaching have master of science degrees. This department is responsible only for instruction in endodontia and periodontia. A combination of these two clinical subjects, in my opinion, is compatible and even desirable because the basis for each is cellular pathology. The pursuit of graduate education by staff members should be encouraged and such activity in one department has a salutary effect on others. I should like to stress the fact that endodontia is a clinical science that combines and applies the learning of several basic ones. It requires a technic and a background different from any other in dentistry. This uniqueness, in my opinion, justifies departmental status. If crown and bridge procedures vary sufficiently from those of operative dentistry to warrant separate divisions as it does in some institutions, more logically, endodontia deserves its own department. If it is to be combined with the teaching of any other clinical science its association with periodontia rather than operative dentistry is more rational.

The actual performance of the technic, properly done, requires time. The usual clinical time requirements for operative and prosthetic restorations are such that little is left to the student for root canal treatment. This fact is another reason why separate departmental rating is needed to stress this exacting operation and to give it the necessary allotment of clinical time particularly since this operation has such a direct influence on patient health. One of the greatest shortcomings in American dentistry today is the lack of dentists with the capacity for doing satisfactory root canal treatment. Now that the focal infection concept has adjusted itself

to a sane position, there appears to be an increasing desire to retain natural teeth. The type of training demanded to preserve pulp involved teeth will be provided best by departments specifically designed to study and teach endodontia.

A stimulating challenge to do good dentistry can be supplied undergraduate teaching by showing students the results of good and bad root canal treatment. In order to provide this stimulant, the student should be able to view the microscopic effect on the pulp and periapical tissue of various types of treatment. The accumulation of cases with adequate histories of treatment and subsequent follow-up examination with x-ray pictures are essential. When a goodly number of teeth have been treated and followed over a period of years, the necessity for the extraction of some of these teeth will arise, not necessarily from the failure of the root canal treatment but perhaps from the failure of the coronal restoration or of the adjacent teeth. Such teeth should be prepared for microscopic study and a close alliance with the department of oral pathology will provide this service. The correlation between the clinical history, the roentgenographic examination, and the microscopic appearance provides what is to me an unexcelled means of correlating the preclinical with the clinical and of making the student conscious and appreciative of his responsibilities in a profession concerned with health and welfare. The accumulation of such teaching material (post-mortem, as it were) is not likely to occur unless a watchful, interested and educated faculty exists. This interest can best be developed by a department of endodontia working closely with the department of pathology. I can conceive of isolated instances where members of the operative teaching staff might develop the desired interest and a collection of teaching material, but I believe that such results would be rare compared with what would accrue from departments charged specifically with that responsibility.

A course in endodontia should consist not only of technical and clinical training but also of lecture and laboratory instruction with pathology, bacteriology and pharmacology as prerequisites. The training at the University of Illinois begins with one quarter of instruction in the mechanical procedures of opening, enlarging and filling root canals. The student has become acquainted with the internal anatomy of teeth through instruction in dental anatomy which is given during the first year. Following his successful completion of the technic course he is allowed to undertake clinical treatment under close supervision. The clinical procedures are explained to the students through motion pictures, demonstrations and lectures during the technic course. In the second year he also receives

instruction in bacteriology. The third year instruction in oral pathology includes lectures on pulp and periapical diseases and material is supplied the student for microscopic study to fortify the lecture instruction. A course in materia medica and therapeutics is given by the department throughout the third year and a thorough discussion of the drugs used to treat pulp and periapical disturbances is included in this instruction. During the fourth year, about six class hours are devoted to a discussion of clinical problems of diagnosing and treating pulp disturbances. Case histories are presented and the miscroscopic findings are reviewed.

Each student is required to treat a number of pulp-involved teeth in his acquisition of clinical experience. The average student will have treated ten to twelve teeth before he is graduated. It is during the clinical instruction that the best opportunity is offered for correlating what the student has learned or should know about pathology and bacteriology, chemistry and anatomy, physiology and pharmacology, therapeutics and medicine. Advantage of this important opportunity cannot be taken without a properly trained staff and I believe that that staff can be acquired and will work best through a department of its own.

The creation of a separate division probably will require an addition to the budget but the request will present another opportunity to show university educators that dentistry has developed in the biologic field as well as the mechanical. Here an area is provided where the dental and medical profession speak the same language. When dentists speak in those terms their medical brethren frequently express pleased surprise. Needless to say such areas should be cultivated. Sufficient evidence has accumulated to prove that root canal treatment properly done can preserve natural teeth in a healthy condition for years of useful service. A properly trained and educated dental profession can impress the medical profession with that fact.

The division of operative dentistry is concerned principally with the skills and technics of dental operations. No one would underestimate the importance of these procedures, but an understanding of tissue injury and response must form the basis for technical performance in endodontia. If endodontia has not yet grown in stature and significance sufficiently to deserve departmental rating, a preferable alliance is with oral pathology because this association will emphasize what is of greatest importance. However, I believe that endodontia can be taught best by a department of its own or combined with periodontia as the two have their basis in cellular activity.

Discussion

B. O. A. THOMAS, D.D.S.,[1] *Seattle*

I have read Dr. Kesel's paper with a great deal of interest because endodontia is taught in the Department of Periodontology at the University of Washington. I have the general impression that too great stress has been placed on the importance of autonomy for endodontia and too little on the fundamental factors relating to proper and successful teaching in endodontia, or any other teaching field.

Although I agree that certain aspects of endodontia technic are different from technic in other clinical dental fields, this does not, in my opinion, justify departmental status, with its implied autonomy. We are losing sight of the relative importance of endodontia in the general practice of dentistry. We ought also to consider that rather than further departmentalization, perhaps we should look towards amalgamating some of the presently existing separate departments. After all, we are educating students to practice all phases of dentistry, not to limit their activities to one field—at least not without additional training.

Another point upon which Dr. Kesel places great stress is that the basic sciences have their greatest application in the field of endodontia. Certainly there are many applications of pathology, bacteriology, etc., to the work in endodontia, but the same can be said of oral surgery, periodontology and certain phases of restorative dentistry. Whenever we use comparative terms we must consider the matter of degree, great, greater, greatest—who can say.

In his opening paragraph, Dr. Kesel states that "the focal infection concept swept the country with great enthusiasm during the decade between 1914 and 1924 largely because root canal therapy was and had been a stepchild of operative dentistry." I doubt that it was "because root canal therapy was and had been a stepchild of operative dentistry." Rather, so many sins had been committed in this field of dentistry in Europe and the rest of the world as well as on this continent, that this fact could no longer be overlooked. It must be admitted that the teaching and practice of endodontia three or four decades ago was not usually of the same quality as that observed today. However, can't this be said of every other field of dentistry? Progress should have occurred since World War I!

The pendulum has not yet come to rest on the subject of focal infection. It is probably wise to reserve judgment on this subject for some time to

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come. We can agree that the condemnation of all pulpless teeth was and is an improper attitude. Whether it is wise to consider every retained pulpless tooth a "saved" tooth may also be open to argument.

At the University of Washington, students in the clinical years (3rd and 4th years) are required to spend at least one clinic period per week in periodontia. They must spend 50 per cent as much time (one clinic period every two weeks) in endodontia. This amounts to a total minimum clinic experience of 30 clinic periods during the undergraduate curriculum. It would be difficult to justify the allotment of more time to endodontia in the presently constituted curriculum, even if endodontia was made a separate department. If those thirty clinic periods are properly utilized, the student, already well grounded by a satisfactory technic course in endodontia, should acquire a very considerable knowledge of the subject and how endodontia may be utilized in the general practice of dentistry.

The mechanical aspects of proper endodontic technic are of paramount importance; unless proper preparations have been made, nature's attempts at biological recovery will end in failure and loss of the tooth. Let us not be ashamed of the fine technical procedures required in any field of dentistry! Certainly, we should pursue the study of the biological aspects of these problems and work closely with our confreres in basic medical fields.

In conclusion, I believe departmental status places unwarranted stress on the subject of endodontia. At our school, it is handled very well as a division of the Department of Periodontology, without slighting either endodontia or periodontia.

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"Thoroughly to teach another is the best way to learn for yourself."—TYRON EDWARDS.

THE TEACHING OF PRECLINICAL CROWN AND BRIDGE PROSTHESIS (Methods and Approach)

(Two papers with discussion presented before the Section on Crown and Bridge Prosthesis.)

1. PRESENTATION OF THE SUBJECT

CARL T. LEANDER, B.S., D.M.D.,[1] *Philadelphia*

Our teaching in crown and bridge on a technic level is based on the concept that this type of prosthesis represents an engineering structure mounted on biologic foundations.

Certain physiologic principles and laws operate in the mouth. These are directed toward the preservation of the teeth and their investing tissues. Injury to or loss of the component parts of the masticatory apparatus initiates conditions of disharmony which may have far-reaching results. It has been stated that "we should be as much concerned with that which remains as with the meticulous replacement of that which is missing." This, then, constitutes the biologic phase of our concept.

In crown and bridge prosthesis we are called upon to provide a mechanical counterpart to replace teeth which have been lost for one reason or another. This counterpart also operates according to definite structural engineering laws which stem from basic principles in physics. These appliances exert forces on the teeth and their attachments. We gain our objectives in restorative dentistry only insofar as we design structures in accordance with mechanical principles that enable us to counteract these forces or bring them within safe limits of tolerance of the oral tissues. This constitutes the structural phase of our concept.

Our didactic and technical teaching is set up to embrace the following categories:

I. Occlusal Equilibration
II. Principles and Preparation of Abutments
III. Structural Principles of Pontic Construction
IV. Design of Connectors
V. Cementation

This seems to us an orderly method of procedure since it serves to integrate the separate technical projects into a functioning restoration.

The initiate to our technic course is thoroughly prepared by the course in dental technology in the technics of handling wax, investing, casting, soldering, and so forth. Principles of inlay construction are taught in

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the Operative Department and we consequently avoid duplication in teaching of the fundamentals. Our teaching area concerns only those modifications involving greater resistance form and bulk. The teaching of porcelain technics is handled by the ceramics division as part of operative and the build-up of pontics and glazing is included in their projects.

The general considerations involved in the above phases of our teaching are as follows:

I. Occlusal Equilibration

When we consider that the loss of a single tooth may create severe occlusal disturbances throughout the whole mouth, the necessity of securing reasonably good functional occlusion at the outset takes on added significance. We would not wish to perpetuate any existing traumatic conditions. Study models required on all clinic cases serve for occlusal studies there.

Consequently, in order to impress on the student the necessity of establishing the best functional occlusion possible he is required to equilibrate his dentoform models. We use blue and red articulating paper; blue for centric and red for eccentric excursions. Tracings made in this way make it easier for him to differentiate between cuspal and inclined plane interference in these various positions. His responsibility for maintaining his basic adjusted occlusion becomes all the more significant as he proceeds with each successive bridge exercise.

II. Principles and Preparation of Abutments

We must admit that our approach to this phase of our teaching is a structural one. During the functional use of our bridge restorations, occlusal forces are brought to bear on the structure as a whole. Directly or indirectly these forces are translated to the points of attachment to the supporting teeth, that is the abutments. Retentive forces compete with displacement forces and the algebraic sum of these serve as an index of the relative retentive value which can be assigned to a particular type of abutment.

We prepare all the abutments and castings for our bridge projects in sequence in the order of their decreasing retentive value and increasing difficulty of preparation. For the student this relates one with the other.

First considered is that type which structurally represents the greatest retentive value, the full veneer cast crown as prepared for a molar tooth. It embraces five surfaces of the tooth, each one of which represents a curved element united into a circumference. This type of structure is best able to meet the demand for rigidity and resistance to circum-

ferential stresses and torque in a mesio-distal plane, by the very nature of its design. This concept of rigidity is illustrated by the usual automobile bumper. Nature in her infinite wisdom certainly used the principles of structural design in providing radially positioned enamel rods.

Impressed upon the students is the relationship of the crown form to the contours of the natural tooth. Considerable emphasis is placed on biologically acceptable crown margins and their association with caries prevention and periodontal health.

As a preliminary discipline the student executes a full crown preparation on a 3x plaster tooth. This gives him a perspective of the proper sequence of steps necessary in order to achieve a retention form with a minimum loss of tooth structure. An outline of proper instrumentation as used clinically is presented. After instructor approval he then prepared the ivorine tooth from his dentoform and carries through the steps of waxing, casting, and polishing.

As we reduce the number of prepared surfaces by one, as in the case of the posterior three-quarter crown, we encounter a unit which has different structural properties. Instead of having circumferential rigidity, it has become U-shaped with more or less flat flanges terminating at the open end. Occlusal forces acting on the pontic section would have the effect of bending these flanges which are entirely analogous to a cantilever beam. A similar problem in structural engineering would be solved by designing a tapered beam of constant strength throughout its length as, for example, an automobile spring. But this would require in our three-quarter crowns considerable bulk in the region of the closed end of the U-shape. This would be inconvenient from the standpoint of pontic construction. Consequently, we endeavor to compensate for this lack of rigidity by cutting grooves near the terminating portion of the flange to act as reinforcing ribs in the casting. The point which I emphasize is that these ribs are structurally insignificant unless they have bulk. In fact, insufficient grooves would, by inclined plane action, do more to displace the flange away from the tooth surface than if they were not present. A further point is that this rib stiffens the flange only in the vertical axis and still leaves the flange weak along the horizontal axis. A stiffener rib along this axis is impossible because of the difficulties in impression-taking and seating of the casting. One structural alternate is to revise our vertical groove so as to create a half dovetail which serves to definitely hold the flange against the prepared tooth and prevent spreading when subjected to compound stresses and to torque in a buccolingual plane.

This preparation is discussed in detail merely to outline the kind of analysis we attempt in our teaching. We aim toward a structural reason for every cut we make.

In considering anterior three-quarter crowns we again apply structural laws to bio-mechanics. In this case the tooth is smaller, we have to build part of the structure on a sloping surface and while it is true that bite pressure is less, our design must be influenced by the problem of esthetics.

We prepare all the abutments for our bridge projects in sequence and for each one we consider a structural analysis of the resulting casting, pointing out those portions which are inherently strong and those which may be weak, unless precautions are taken in the preparation and/or the wax-up.

Inasmuch as our preparations vary because of variations in tooth form, nevertheless this structural approach equips the student with basic principles so that he can, by orderly reasoning, create an abutment that will meet the necessary biological and mechanical requirements.

The underlying principles of all our preparations is that primarily they should be self retained when functional stresses are applied to the bridge structure and that the cement bond represents secondary retention, mostly to resist negative pressures. For this reason we use inlays as retainers sparingly and only when the resistance form has been fortified in accordance with the above principle. Inlays acting in the role of supports are invariably MOD preparations in order to protect the tooth from possible caries.

Visual aid equipment in the form of slides and motion pictures is particularly effective in bringing home to the student the structural design and technic of special abutments, the application of forces and the structural effects they produce.

III. Pontic Design

The form and function of the pontic section accomplishes the original purpose of the bridge, namely, the replacement of the missing teeth. The structural design of this section has a definite counterpart in the structural beam. The same structural laws apply and the structural effects of bending, compression, tension, and shear are similar.

Consequently, we correlate three types of beams to the corresponding dental structures, namely, the cantilever bridge, the broken stress type, which is fixd at one end and supported at the other, and finally, the completely fixed type.

A variety of forces is exerted on the pontic section and these are transmitted directly or indirectly to the retainers and the teeth. Con-

sequently, its design can be governed by structural principles. For example, the strength of a beam of rectangular cross-section will be proportional to its width and the square of the depth. That is, in two beams of the same width, for example the same buccolingual dimension, the one which has twice the depth will be four times as strong and will have one eighth the amount of bending or deflection. This is important from the standpoint of loosening or breaking our porcelain pontics. Then again, the deflection of a beam varies directly as the cube of the length, so that a completely fixed bridge of two premolar pontics should be made considerably stronger than an equivalent bridge of one pontic, other things being equal.

We discuss the universally accepted practice of reducing the occlusal area of the pontic section; its effect on the strength of the span; its effectiveness in reducing the stress in the bridge when distributed loads are brought to bear on it as in chewing meat; its ineffectiveness when subjected to a concentrated load on a small area as in chewing a piece of "life saver" and finally the dynamic loading effect of a suddenly applied load when this same "life saver" lets go, causing essentially twice the stress and twice the deflection as compared to a gradually applied load.

The direct effect on the student is that he has a better concept of what bridge construction implies. After translating Dr. Tylman's recorded data on bite poundage into terms of functional stresses on a relatively small structure like a bridge, the student has a healthy respect (literally and figuratively speaking) for the supporting teeth.

The technic of the major types of porcelain pontics is covered by slides and assigned reading, although our teaching is directed toward those which have the replacement feature. To facilitate the handling of closed bite cases or those involving very short spans, we have improvised a gold occlusal-acrylic technic as shown in the accompanying models. This type is easily constructed for one or two pontics and lends itself to principles of structural design inasmuch as the width, depth and characteristics of cross-section of the stress bearing span can be controlled. The acrylic, which is locked in under the span, provides for a tissue acceptable surface.

IV. Design of Connectors

In the case of short structural beams the principle stresses are those of shear. As the beam becomes longer, bending moments and end moments, present in all beams, become more significant. Of interest to us is the fact that end moments and shear operating at the end of the pontic

section relate directly to the design and manner in which we execute our solder joints. There is need for more physical property data regarding what may be expected in joint strength under student manipulation, especially if the soldering has to be repeated because the bridge does not go to place. We cannot use data on solder alone because of re-alloying effects. Then, too, the area and contour of the joint is important because of the desirability of opening up under the joint for reasons of sanitation.

We would like to make our bridges lighter and stronger through the benefits of hardening heat treatment but are faced with increased brittleness, or lowered percent elongation of the joint itself.

On the other end of the span, in the case of the broken stress or semi-fixed bridge, the design of the support lug is subject to structural treatment. These bridges are short, usually involving the replacement of one tooth. We have average bite poundage data and know that the maximum shear will come when the load is adjacent to the lug position and is thus independent of the length of the span. From this it is simple arithmetic to determine the required shear area of the lug for the proportional limit in shear of the gold you use.

We have improvised a carbon lug form according to these calculated dimensions. This is imbedded in the wax, held in place by the investment and the casting made against it. It is easily chipped out leaving a clean, sharp lug rest. The saving of time, temper and gold is obvious. An interesting point is that, even though the wax is pressed firmly into the rest, the pontic casting has just enough leeway to permit differences in functional movement of the abutment teeth.

The rationale of its design and use is brought out here merely to show how structural principles can be made useful in our crown and bridge teaching.

V. Cementation

It is an accepted fact that a well planned and constructed bridge can be ruined in the process of cementation. We make it a rule that wide mouth jars of bicarbonate solution be on the bracket table when a bridge is to be placed. When one views the extraordinary layer of cement under bridgework which has become displaced, it is no little wonder that it stayed on at all when in function.

However precise our impressions and castings may be, some compromises in fit are bound to occur. A cement layer is both desirable and necessary. We have some data on the physical properties of cement but none on its behavior in thin sections, especially when in between a rigid surface of gold and comparatively resilient dentin.

Variations in the form that our abutments may take, for example, pin preparations and other constricted areas, can make for considerable variations in the way the casting will be cemented to place. The relative retention value we assign to a particular design of retainer should be modified accordingly.

We use this concept as an avenue of approach to teach abutment preparations in retrospect.

We have sectioned in several planes different types of crowns cemented in place under varying conditions of pressure and consistency. Measured thicknesses of the cement and overlying gold are revealing. In order to take advantage of the most favorable surface characteristics for cement bonding, we discourage the use of sandpaper discs and confine our finishing of preparations to the rounding of line and point angles.

As a matter of interest we are recording herewith the various crown and bridge exercises included in our technic course.

BRIDGE PROJECTS

I. 4 unit posterior bridge—complete fixation
   2nd molar—full cast crown
   1st premolar—three-quarter crown
   1st molar pontic—Steele's Tru-pontic
   2nd premolar pontic—special cast occlusal-acrylic

II. 3 unit lower posterior bridge—broken stress type
   2nd molar—three-quarter crown
   1st premolar—MOD inlay, box type, cast with special lock type carbon lug form
   1st molar pontic—Steele's Sanitary pontic
      This bridge duplicates the complete clinic routine. It is unsoldered, re-oriented, resoldered and finally polished.

III. 3 unit upper anterior bridge—semi-fixed type
   canine—three-quarter crown
   central—distal inlay with lingual lock and rest
   lateral pontic—Steele's facing

SPECIAL CROWNS

Upper central—cast core with dowel and lingual apron processed acrylic jacket.
Upper canine—full cast crown with acrylic insert.

We have presented herewith some concepts of technic teaching which seems to us to be directed toward the establishment of some fundamental principles. We would like to feel that in so doing, the student is encouraged to think effectively and to be stimulated to analyze the reasons for every operation.

Discussion

FRANK C. STARR, D.D.S.,[1] *Columbus*

Please permit me to congratulate Dr. Leander for a most excellent paper on crown and bridge prosthesis, in fact, it is so complete that little is left to be discussed.

We follow very closely the fundamental outline given in Dr. Leander's paper and confine the technical procedure as covered in our sophomore technic. Our sophomore class is required to make:

1. A ¾-crown preparation on an extracted tooth; copper band is fitted and festooned, compound impression, kryptex die made from same after which 28-gauge matrix wax is carefully adapted, hard inlay wax built over same for contour, pattern removed and returned to tooth for final adaptation by linen strip, invested and cast.

2. A full-line crown preparation, also from an extracted tooth being reduced uniformly to a finished line just beneath the gingival line after which the same type preparation is made on numite tooth on typodent, band fitted and festooned, amalgam die made from band impression, then casts are mounted on articulator with amalgam die in place. One thickness of lead from X-ray film is burnished over the occlusal of die, crown is then waxed, articulated and anatomy carved. Removed from cast, contact added, lead foil removed from inside of crown, invested and cast.

Our first bridge is a two-tooth cantilever type, ¾ crown on cusipd supplying lateral trupontic, same being semi-saddle fitted to ridge area and super-glazed.

The second is a three-tooth bridge, Class II inlays, upper second bicuspid to second molar supplying first molar, recess area in molar inlay to reinforce solder area. A hole is drilled in distal of bicuspid inlay with No. 6 round bur, reamed for under cut to provide movable attachment; gold occlusal and acrylic pontic. Aromatic spirits of ammonia is used as an anti-flux in the hole in bicuspid. A similar type three-tooth bridge supplying the lower first molar with a dovetailed inlay within the inlay attachment is also required.

The third and final is an acrylic jacket crown. This completes our sophomore requirement. Since the student has had inlay cavity preparation, the only change we require is additional retentive features, such as acute angle at cervical and shallow-well areas as illustrated in slide. The ceramics are carried out in our crown and bridge department. A

[1]Chairman, Crown and Bridge Department, Ohio State University.

hard gold is used in all our bridge construction for maximum strength and minimum bulk.

Some years ago, I was constructing a bridge for a railroad engineer. In describing the ball-and-socket attachment which permits individual tooth movement in function, he was surprised, and stated that the principle was not unlike that employed in railroad bridges as they used broken stresses from one abutment to the other; otherwise, the abutments would not withstand the strain of traffic.

We have arranged with a number of our exodontists to save their extracted teeth, preserve them in a sterilizing solution so that we can provide our students with extracted teeth in making their various types of preparations and in studying dental anatomy, thereby giving a far better understanding of the relationship, enamel to dentine, cementum, pulp, etc., which they do not get on dentiform models.

The junior students are admitted in the clinic, and we follow through with lectures and procedures as practical cases present; such as the ¾ gold acrylic veneer crown, M.O.D. inlays and onlays to correct occlusal planes with additional retentive features as required in supplying more than one pontic, stressing the importance of making a complete oral diagnosis; first with full-mouth X-ray and study casts that a complete picture may be had as to the requirements for putting the mouth in the best possible condition from a functional and biological standpoint before any operative procedures are started.

2. PRESENTATION OF THE SUBJECT

ROBERT P. DRESSEL, D.D.S.,[1] *Cleveland*

In discussing the subject assigned to me, "Methods and Approach to Teaching Preclinical Crown and Bridge Prosthesis," I am going to devote the greater part of the allotted 20 minutes to the "approach" phase of the subject. Further, I would like to base my few remarks on the premise that a liberal interpretation of the word "approach" can mean, "planning" of the course and "contents" of the course.

As members of our respective crown and bridge staff, we have, primarily, one function to perform and one only—that function being to teach. It naturally follows, therefore, that our teaching of others will be on a plane comparable to that which we have been taught as students or that which we have learned later by experience. Consequently, it would seem to me that in planning a course for preclinical crown and bridge prosthesis, certain facts should be borne in mind:

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1. The course should be comprehensive enough to adequately provide sufficient working knowledge for the student to meet the needs of his private practice with respect to the social and financial status of all patients.

2. It should be comprehensive enough to meet the demands of all patients within the limits of present-day accepted crown and bridge work.

3. It should be broad enough in scope to reduce to a minimum the necessity for additional postgraduate instruction.

4. Certain technics and exercises should not be over-emphasized at the expense of more sound and basic technics and exercises.

5. The course should not stem from the personal likes or interests of the section chairman or department head.

6. The student should not be deprived of that which he has a right to expect in the way of a well-rounded and balanced course of instruction.

Very obvious dangers are present to confront a department head in any school of any university where multiple departments must be integrated into a single unit whose purpose is to qualify students for graduation into their respective fields of endeavor. One is the feeling or the attitude taken by many department heads that his department is of paramount or major importance and should be given more consideration and recognition in the curriculum, and because of this feeling the department is operated more or less independently of others with little or no thought of integration. By the same token a department should not be de-emphasized into jeopardy in order to conform to a predetermined clock-hour laboratory schedule. Another danger is that of department stagnation. Such a department will slowly but surely die unless transfused from time to time with new blood in the form of new ideas; new, revised and improved lectures; new technics and revision of old ones; new personnel, etc. Still another danger can well be expressed by the phrase, "What was good enough for my predecessor is good enough for my contempararies and my successors." This line of reasoning is too ridiculous to merit serious consideration. Other department dangers and pitfalls can readily be called to mind by all present and need no specific mention here.

Formulating and organizing the preclinical course in crown and bridge prosthesis might be approached under the following headings:

1. Object of Course
2. Contents of Course
3. Method of Presentation
4. Results Expected.

The object of the course should be to acquaint and familiarize the student with the more practical and commonly used types of work met with in the clinic and eventually in his own private practice. In breaking down the above thought, I can do no better than to repeat the summation presented by Dr. Tylman at the close of the 1949 crown and bridge conference session:

1. To familiarize the student with the basic materials involved.
2. To give the student an understanding of the basic operations required.
3. To emphasize those parts of the basic science courses which pertain to this special field.
4. To teach principles of mechanics and physics pertinent to this field.
5. To require sufficient exercises which will demonstrate the various types of restorations and require the fullest digital skill.

The contents of the course should include, among others, the various types of bridges in common use, the all-rigid, the semi-rigid and fixed-removable; basic, fundamental, practical and common sense abutment preparations; various types of pontics, various types of practical full crowns and the limited use of acrylics and hydrocolloids. Outmoded and obsolete technics and types of work should certainly be deleted from the course. Types of work that can be supplanted by others just as practical but more simple of execution should not be included in the course solely for the reason that it is a State Board requirement for licensure by some states. It would seem to me to be more logical for the school or schools to endeavor to convince the State Boards that revision of their requirements in keeping with present dental trends might be advisable.

A well rounded laboratory course should be presented by means of lectures, laboratory manuals or syllabi, group demonstration and individual instruction. Now, despite the fact that I included lectures above, after a sufficient number of years of endeavoring to teach crown and bridge work, I feel that I can authoritatively draw some conclusions, to my own satisfaction at least, relative to my seemingly futile attempts, the most pronounced of which is that lecturing is one of the least effective methods of disseminating preclinical crown and bridge instruction—not that the lectures themselves are devoid of information but rarely, if ever, does a student again refer to his notes, except when preparing for examinations, nor does he make any serious attempt to correlate his lectures with laboratory procedures.

If one is to subscribe to the thought, "We learn by seeing and doing,"

then one must necessarily endorse the thought, "We learn by repetition." A few years ago when the committee visited our school for the purpose of reclassification, the chief criticism of my department was, "duplication of effort and slight overlapping of teaching with the department of dental materials." This duplication of effort and overlapping was not accidental—it was intentional, consistent with the thought that we learn by repetition. Repetition and duplication of effort, if kept within bounds, I consider good and effective teaching.

So, the student is lectured to, or I might say at. In the laboratory he finds his laboratory manual or syllabus whether he refers to his lecture notes again or not. The same material, but in greater detail, is in the manual. Then for purposes of regimentation, his work or technic card presents again, in brief, the essential steps for that particular project. Small group demonstrations of some part of that exercise are presented in the laboratory and finally, individual instruction and demonstration is tendered.

Just what constitutes adequate laboratory personnel is always a debatable question. What is an equitable arrangement with fairness to both student and instructor? Is it laboratory instruction or laboratory checking? Perhaps the ideal would be one instructor for every ten students if the goal is to be laboratory instruction instead of merely punching project cards. Some of you might say one to fifteen while still others might maintain that one to twenty is not too bad an arrangement. At present my department has a ratio of one instructor to approximately twenty students, due to circumstances beyond the department's control.

A healthy aspect of laboratory instruction for both student and instructor is the rotation method. The class is equally divided into as many groups as there are instructors with each group assigned to an instructor for a given number of weeks, at the end of which time each group is assigned to another instructor. By this method each instructor is given an opportunity to judge the ability of each student for himself and is better able to pass judgment on each finished project. It also reduces to a minimum disturbing influences such as personal likes and dislikes of the instructor for individual students which, for the moment affects his judgment, fraternity policies and politics, favoritism, prejudice, class politics, personal relationship of instructor and student and many others.

Now may I present briefly tangible evidence that in formulating the course in preclinical crown and bridge prosthesis at Western Reserve University, I have attempted to incorporate in that course, the thoughts and views I have just expressed above. There are six projects or exercises

required with a total of 64 didactic and 238 laboratory hours. (All in the sophomore year.)

Project I. Seven abutment retainer preparations on plaster teeth of five diameters:

A Standard three-quarter veneer crown preparation on an upper cuspid

B Standard three-quarter veneer crown preparation on an upper central incisor

C Box type three-quarter veneer crown preparation on an upper biscuspid

D Groove type three-quarter veneer crown preparation on an upper first molar

E Groove type three-quarter veneer crown preparation on a lower first molar

F Full veneer crown preparation on a lower second molar with a mesial box

G Box type three-quarter veneer crown on the lower first bicuspid.

Project II. Lower left, three unit semi-fixed bridge replacing a first molar. A groove type three-quarter veneer crown is made for the second bicuspid with a full cast veneer crown on a second molar. A key lock type of stress breaker is used on the second bicuspid. The pontic is a Steele's Sanitary posterior with a cast occlusal.

Project III. An upper right three unit semi-rigid bridge replacing the second bicuspid.

Standard groove type three-quarter veneer crown preparation on the first molar. A three-quarter veneer crown preparation is used on the first bicuspid with a groove on the mesial and a box on the distal to accommodate the precision rest. A Stern's precision rest is used as the stress-breaker. The pontic is a tube tooth with a cast base.

Project IV. An upper left four-unit all fixed bridge replacing the first and second bicuspids (Tinker type). Standard groove type three-quarter veneer crowns are used on both the cuspid and the first molar. The pontics are long blunt pin facings with baked on porcelain root tips and cast backings.

Project V. A standard three-quarter veneer crown preparation and casting on the upper right cuspid. This abutment retainer is to be used later as a part of a project in the preclinical ceramics requirement of the junior year.

Project VI. A lower right three-unit fixed-removable bridge replacing

a first molar. (Precision bridge using Stern's attachments.) A box type three-quarter veneer crown is used on the second bicuspid, a full cast veneer crown on the second molar with a box on the mesial to accommodate the sleeve of the attachment.

Two practical examinations are given each semester in addition to the above projects, embracing abutment preparations, making of wax patterns, and casting and fitting of crowns.

The preclinical course in ceramics given in the junior year consists of eight hours of didactic work and 48 hours of laboratory instruction in the first semester and eight hours of didactic work in the second semester. There are three projects.

Project I. A porcelain veneer crown on the upper left central incisor.

Project II. An acrylic veneer crown on the upper left central incisor, using the same abutment preparation that was used for the porcelain veneer crown.

Project III. An upper right three unit all-rigid bridge from right central incisor to right cuspid, replacing the lateral incisor.

A thimble veneer crown is used on the central incisor with a labial and incisal veneer of acrylic.

The cuspid retainer was Project V of the sophomore crown and bridge prosthesis preclinical requirement. The pontic is a Trubyte Steele's facing with a cast backing.

To evaluate the results expected from a course such as the above or those of similar content would be but to recapitulate that which Dr. Tylman has already given us, namely:

1. To familiarize the student with the basic materials involved.
2. To give the student an understanding of the basic operations required.
3. To emphasize those parts of the basic science courses which pertain to this special field.
4. To teach principles of mechanics and physics pertinent to this field.
5. To require sufficient exercises which will demonstrate the various types of restorations and require the fullest digital skill.

We do not expect to graduate students as specialists in the field of crown and bridge prosthesis. All we can hope and expect is that they will have retained a sufficient number of basic fundamentals which will enable them to practice this particular field of dentistry judiciously and wisely.

Discussion

DOUGLAS H. YOCK, D.D.S.,[1] *Minneapolis*

The objectives of a preclinical course in crown and bridge work have been well stated by Dr. Dressel in his own words, and well summarized in a recapitulation of Dr. Tylman's remarks of last year. I believe that we are in agreement as to what these objectives are.

Early in Dr. Dressel's discussion, he mentioned the obvious dangers confronting a crown and bridge department head; problems of integration, stagnation, de-emphasis, etc. I would like to spend a minute in discussing what might be termed "administrative aids" to some of these problems.

We at Minnesota are trying to solve the problem of integration with other departments by three activities which act as coordinators.

1. The executive faculty meetings held once a week, wherein administrative problems are discussed and the correlation of teaching procedures and problems are aired. A departmental head is thereby acquainted with the problems of the entire school, and this should serve as the balancing wheel to keep the enthusiasm for his own department within due bounds.

2. The second aid is a well-organized and properly functioning department of diagnosis. Treatment planning should be so executed that all divisions concerned feel that they have cooperated to this end.

3. Third, class committee meetings. Each class, freshman, sophomore, junior and senior, has its individual class committee, composed of instructors teaching subjects to that particular class in that particular quarter. The class committee should meet several times a quarter, and the advancement and activities of the students, and the problems of the various departments during that quarter, are discussed. Recommendations of solutions to any problem can be referred to the department head and can then be discussed and acted upon by the executive faculty.

Personnally, I feel that there is no other department or phase of dentistry nearly as important as the department of crown and bridge prosthesis. A teacher in operative dentistry feels the same way about his department. This is as it should be. I feel that any teacher of crown and bridge, any department head, who has the feeling that his department is "of paramount importance and should be given more consideration in the curriculum" and so on—that this is a healthy attitude, and will be kept within due bounds by some application of the three aforementioned suggestions.

Another point of discussion I would like to consider is the problem of repetition. To quote Dr. Dressel, "We learn by seeing and doing"—

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"We learn by repetition." Repetition as ordinarily understood does not necessarily account for learning. Only as the student desires to obtain correct results—as he obtains them—does he learn from repeating the exercise. Repetition is important in the preclinical training of dental students, I feel, because as he repeatedly tries to obtain his goal, the repetition produces a favorable condition for acquiring the necessary insight. We, therefore, must accept repetition, habit formation, as an important part of our preclinical program. However, the tendency is to continue this same teaching procedure in the latter years of student instruction when learning must change from that of habit formation to that of a creative process which will enable the soon-to-be "practitioner" to solve problems and cope with new situations.

In preclinical crown and bridge prosthesis, at least for the first several exercises, we must teach the student as if the future will be a repetition of experiences having the same pattern as his laboratory procedures. Having accomplished this through repetition, we must, before he graduates, prepare him to accept the reasoning that future experiences may be different from past experiences; and he must pass from habit formation to learning as a creative process with initiative to be resourceful, independent, adaptable to move forward.

Tied in with this problem of student development is the problem of lectures. If a lecturer in crown and bridge prosthesis has not experienced the reaction of Dr. Dressel in regards to lecture programs, and if he has not seriously wondered at his own inability to accomplish something through this means of teaching, I believe it would be time to begin worrying about the probability of stagnation. Even using all the tricks of the trade: well-organized lectures, mimeographed outlines, slides, motion pictures; the primary problem will still exist—that of developing the mental activity of the student himself. There definitely is a place for good, sound, systematic exposition to stimulate the mental activity of the learner. It is extremely difficult to do this in a preclinical course of lectures which must be quite basic in teaching fundamentals of technic. We can only continue to try to develop and to improve our lectures by using more and more of our visual aids as an adjunct to our exposition.

The problem of adequate laboratory personnel and the suggestion of rotation of instructors is important and timely.

Without question, any crown and bridge department chairman would relish the thought of having a preclinical teacher-student ratio of 1 to 10. The actual ratio understandably is usually governed by budgetary allotments, but where an instructor is responsible for too many students, his time must necessarily be spent doing little more than just plain card punching or checking. I believe the suggested plan of Dr. Dressel's, to

rotate the instructors in technic is a good plan, provided the rotation is not too rapid. Considerable time is needed for the instructor to get to know the students within a section, to find out which ones need the greatest amount of help, prodding, to fit oneself to the individual student's ability and personality. I believe I would question a rotation oftener than twice a year where the preclinical laboratory instructors met from two to three times a week. In addition, I think it is good practice to rotate the preclinical technic instructors, one at a time, to the clinic floor for at least one quarter out of each two years, and to have the clinical instructors spend the equivalent time in technic work.

For a few minutes, I would like to discuss a plan of setting up preclinical laboratory instruction which we use at Minnesota and to which I am very partial.

One instructor, and he must be a good one, is made responsible for the preclinical laboratory instruction. He prepares the lectures, gives and corrects the examinations. He is responsible for the standings and accomplishments of the students. He represents the crown and bridge preclinical department at the class committee meetings. He is responsible for the requisition of supplies and their distribution. He is responsible for the development of teaching aids using his instructors as assistants and whatever other personnel that is available for this purpose. In the laboratory, he is a floating instructor. Each section has its instructor responsible for teaching its individual students. The technic head is responsible for the correlation of these sections. If the technic head is a go-getter, as this job demands, he will spend considerable time teaching and assisting in each of the sections. His attitude and personality will set the pace for the instructors. Such a program gives the sectional instructors a lift. The technic chairman also serves as a fill-in for an absent instructor. I believe the laboratory activities and lecture course are better synchronized with this plan of operation.

In Dr. Dressel's paper, he presented his preclinical laboratory technic requirements in crown and bridge prosthesis. Naturally, we compared his requirements to our own, and wish to sincerely compliment him on having what we consider a well-rounded course of instruction. I was particularly pleased to see the use of the semi-rigid attachment as a part of the technic course. I like the idea of incorporating into a single piece of technic the use of more than one pontic. I also am in agreement with an earlier statement of his suggesting a limited use of acrylic and hydrocolloids.

I feel that Dr. Dressel has presented to us a very complete, well-organized, informative paper.

THE TEACHING OF PERIODONTIA

(Two papers presented before the Section on Periodontia.)

1. STATUS OF PERIODONTOLOGY IN THE UNDERGRADUATE CURRICULUM

(Based Upon a Survey of Opinion of Periodontology Teachers in the United States and Canada.)

HAROLD J. LEONARD, D.D.S., B.A., *New York*

A letter was sent to the 152 known teachers of periodontology in the United States and Canada in late January. At the time of writing, March 12th, 35 had replied. Since most of these required painstaking analysis and notes I was rather glad there were not more. I think those that replied probably covered the ground pretty well and significant conclusions can be drawn from the discussion.

I use the word periodontology as the all-inclusive term embracing science and practice. Periodontia is the art of diagnosis and treatment.

The first phase of the survey was in regard to teachers of periodontology, especially the clinic teachers. Are they sufficient in number, are they, themselves, expert and enthusiastic periodontists and is periodontology their primary interest?

The answers varied, of course, with the development of the subject in the schools and the cities in which the schools are located. There seemed to be a common opinion that there should be one clinical instructor for each eight students working on periodontia cases. Also that all cases coming to the clinic for operative and partial prosthetic replacements should have all necessary periodontal care and that there should be enough instructors to supervise this. Most of the schools apparently do not have enough periodontia instructors to meet these needs.

Most of the letters indicated a need for much better trained instructors. Some complained because instructors are not well trained in the routine technics of periodontia, or do not observe early signs of disease; others, that the instructors are not sufficiently educated or interested in the fundamental sciences to bring out scientific bases for the dental and oral conditions seen in the clinic; still others, that the instructors are not sufficiently trained and experienced in the problems of operative and prosthetic dentistry, and orthodontics, hence they make themselves ridiculous

in attempting to confer with members of other clinical departments in the treatment planning of complicated cases. Where older periodontists only are available as clinical instructors the difficulty reported in one letter is that their treatments are not well balanced; one depends on drugs, another on surgical resection and still another on diet correction as his main reliance. It seems evident in analyzing this phase of the replies that the inadequate preparation of the teachers of periodontology is a very large part of the reason for indifference toward the subject and department by students and other members of the faculty.

Perhaps the status of the preparation of staff to teach periodontology in some of the schools can best be illustrated by including one self-revealing letter verbatim:

"Dear Dr. Leonard:

"After talking over your papers with several of my colleagues we reached the following final conclusions as to why periodontology is not adequately taught in our universities:

1. Etiology unknown
2. Treatment not known or inadequate
3. Diversity of opinion by authors in current literature
4. Different opinions by various members of the staff
5. Laxity of interest on the part of the patient
6. Inability of patient to undergo a long period of treatment
7. No belief that there is actually a cure possible with the present means of treatment
8. Some schools have staffs inadequately trained to teach periodontology
9. Lack of interest on the part of the teachers of operative dentistry
10. In some schools the science of periodontology is "swallowed" up in other courses

"I hope this summary of popular belief relieves your burden somewhat, but I believe you have a long struggle in store for you. Feel free to call on me for any further help I may give you in the form of correspondence"

The second phase of the study relates to the curriculum, the time allowed for periodontology teaching, the arrangement and the organization of the time. The letters were divided on the time allowance, most being very positive that insufficient time is allowed and a few that the time allowance is sufficient in their schools if it could be properly arranged in the curriculum.

Many of the letters bring out the influence of the usual state board requirements which lay such emphases on operative and prosthetic technics that the schools are forced to give these subjects excessive time allotments in the curriculum at the expense of subjects like periodontology

which the state boards ignore. One letter, however, tells of the State Board Examination in Tennessee which includes a written and clinical examination in periodontology. This is the beginning of a reform, a bright spot in an otherwise gloomy picture.

The arrangement of time came in for some severe criticism. Many felt that some teaching in the preventive aspects of dentistry should start at the beginning of the student's contacts with dental subjects. At many schools the first dental subject is prosthetic technic. Such an arrangement starts the student off with the idea that prosthesis for missing teeth and parts of teeth is dentistry. Instead he should get the idea at the outset that the maintenance of and restoration to health, function, comfort, and beauty of the natural teeth are the main function of the dentist and that most of the technics of dentistry are but means to that end. Just how such emphasis might be introduced in the first or second year of the course was not well brought out.

Several criticized the method of clinical training in periodontia by which the student does not have the opportunity to follow his cases through to their successful conclusion. He gets training in the disagreeable technics of root surface curettage and occlusal adjustment but does not get the compensatory joy of seeing the case after the gingivae have become pink and firm and the teeth tight in their sockets. Demonstrations by instructors of excellent results do not take the place, in these writers' opinion, of having the student do the work himself on many different types of cases and following them through until successful results are evident.

The third division of the survey relates to correlation with other clinical departments of dentistry, starting with oral diagnosis. It is evident from the replies that the effectiveness of the teaching in periodontology is very dependent on the attitudes and effectiveness of the teaching in oral diagnosis. It is certainly impracticable for every case coming to the school clinic to be channeled through the periodontia clinic. Therefore early signs of periodontal pathosis and indications for treatment must be picked up and pointed out to students in the oral diagnosis clinic. This means that the teachers in the oral diagnosis clinic must be well trained in periodontology as to causes, symptomatology, systemic relationships and as to results to be expected from treatment. They should be able to point out to students what might be done for the patient in a well organized dental office and what can be done in the school clinics where technics must be kept simple and fool proof. As one writer points out the student often gets in the habit in the school clinics of demanding extraction of affected teeth for the patient which he would make every effort to have saved were they in his own mouth.

It should also be the duty of the oral diagnosis department to break down the tendency of the clinical departments to become separate walled off units. Many letters criticized this tendency toward compartmentalization in the schools. It would seem peculiarly the duty of the oral diagnosis department, working with the department of periodontology to keep the main objective of dentistry before the students, which, as noted before, is the maintenance of and restoration of health, comfort, function and beauty of the natural teeth with most of the technics of dentistry as means toward that end. Such an attitude prevailing in oral diagnosis should greatly tend to break down compartmentalization and promote correlation all along the line. Most of the letters showed that such correlation between oral diagnosis and periodontology does not exist or is in an unsatisfactory state.

Correlation between periodontia and prosthetic dentistry is also unsatisfactory at most of the schools, according to the correspondents. This is bad for both patients and students. According to one correspondent, the prosthetic teachers seek advice and consultation only in cases in which there is danger of failure and they seek someone to share the responsibility. Since a most important function of bridge work and partial denture prosthesis is to support the remaining teeth and offset strains and stresses which injure the periodontal tissues and aggravate or predispose to periodontal disease, it would seem self-evident that the two departments should work together in the treatment of patients in which loss of teeth is a factor. Properly designed bridges and partial dentures are important elements in treating periodontal disease. Likewise periodontal disease due to insanitation is a most important cause for failure of fixed bridges and partial denture appliances. The closest collaboration should therefore exist in planning for and treating patients and instructing students in these interrelationships. Such collaboration apparently does not exist at most schools, judging by the correspondence, in fact some report that the departmental teachers are so far apart that students in steering their patients through the various departments are terribly confused by the cross-purposes and conflicts in ideas. Correspondents decry the lack of collaboration but do not offer satisfactory suggestions for administrative machinery for obtaining it. It takes much teacher time for the conferences necessary for good collaboration.

In regard to cooperation between periodontia and operative dentistry the chief complaint seems to be that the teachers in operative dentistry refer their cases to periodontia to be "cleaned up" in preparation for operative dentistry procedures. This attitude puts the periodontia student in the position of a dental hygienist and he is resentful. The correspond-

ents thought it was one of the reasons why students dislike periodontia and avoid it all they can both in school and after graduation.

Another complaint is that most of the older teachers in operative dentistry are not scientifically well educated and have but little idea of the biological approach to dentistry or understanding of periodontal disease. This lack of information hinders cooperation with the departments of oral diagnosis and periodontology in establishing the true objectives of dentistry in the student's mind.

Correspondents were about evenly divided as to whether correlation between periodontology and orthodontics is satisfactory or not. Since orthodontic treatment should be a means frequently used for treating teeth which are unstable and have periodontal injury due to tilting and shifting, even in elderly patients, there is a need of a much closer cooperation than has been envisioned in the past by either department in most of the schools.

Let me close this phase of correlation of departments by quoting from a letter from Dean Russell Bunting:

"There must be a general agreement on the part of the whole faculty that periodontia is important, and a willingness to give proper weight to its teaching. In diagnosis, it should have first consideration and all operative dentistry and partial denture prosthesis should be predicated on the health of the supporting tissues about the teeth. If in any school clinical dentistry is taught without a firm requirement that all existing periodontal infections and diseases be treated before operative reconstructions are begun, the teaching of periodontia as an undergraduate subject is futile and bound to failure. The conversion of the entire faculty to that point of view is, in my opinion, the only hope of bringing periodontia to its rightful place in the dental curriculum."

The fourth heading of our survey relates to obstacles in the school which interfere with effective teaching or with learning on the part of the students. The first obstacle mentioned was indifference or ridicule on the part of teachers of other departments. Not so long ago ridicule was the common attitude toward earnest young teachers trying to introduce periodontology theory and practice with its change of philosophy as to the objective of dentistry into schools where the worship of restorative technics of dentistry had never been questioned. According to most of the correspondents this time is nearly past. Very few report that their efforts are hampered by ridicule by teachers in other departments; by indifference, yes. Most report that there are spots where indifference and lack of understanding exist and that this greatly interferes with the efforts of the periodontology teachers to create interest and enthusiasm for periodontia.

One correspondent points out that periodontia is very difficult, disagreeable and tedious work. It is only to be enjoyed when viewed as a

means to a worthwhile end, which is a beautiful, healthy mouth. When the technics in dentistry are viewed as all joined together for the attainment of this end, students can take the disagreeable with the agreeable in the attainment of the goal without complaint. However, when the other teachers are indifferent to the goal and instead focus the student's attention unduly on restorative technics as the end and aim of dentistry, it makes effective periodontia teaching difficult if not impossible with most students.

Letters reporting from schools where teachers in all departments are mostly young and highly selected for scientific background as well as ability in their departmental work, indicated that difficulties of indifference and lack of common aims do not seem to exist.

It is not alone the teachers of other departments who make the trouble, as one correspondent pointed out. Fathers and uncles and friends outside who are dentists of the old school can quickly undo much of the idealism and good philosophy so painstakingly cultivated in the minds of dental students. The old school dentists from the time of Horace Hayden in 1840 to date have been taught and thoroughly believe that periodontal disease is incurable. Such a belief on the part of respected elder dentists outside tends to nullify much of the teaching of the periodontology teachers and requires much successful experience on periodontia cases in the school to counteract it.

Another hurtful idea that outside dentists bring to students is that time spent in periodontia does not pay as well as that spent in making fillings and dentures. As several correspondents pointed out, this is due to a defeatist attitude on the part of the dentist. If he is sure of himself and his work in this field and sees his periodontia as a necessary means toward the goal which he has set for his patient of a healthy, beautiful set of natural teeth, he will have no difficulty convincing patients of the desirability of paying for the service as well as for any other.

Some correspondents think that the low fees charged for prophylaxis and periodontia treatment in the school clinic throw discredit on these services in the student's mind. If whoever has the education of the patient as to his dental needs and the costs, is well briefed on the objective of dental treatment and the part of periodontia therein, it should be no more difficult to get a commensurate fee for prophylaxis and periodontia in the school clinic than in the dental office.

Another correspondent thinks the small amount of credit given for prophylaxis in his school has the effect of belittling it in the student's mind.

A more serious obstacle to good training in periodontia as reported by several correspondents is the intense preoccupation of the student,

especially in the senior year, with his technical requirements. He is so harassed by the pressure of the number of fillings, bridges and dentures that he must have in to graduate that he resents the time he must spend in periodontia practice. This difficulty goes back to the state board requirements and to the worship of restorative technics by old school dental teachers and administrators mentioned before. As one correspondent pointed out, no one wants the training in restorative technics to be weaker than it is now for it is none too good as judged by the output of graduates. But perhaps when the objectives of dentistry are presented as mouth health, comfort, function and beauty, in which nearly all dental technics are a means to the end, and not an end in themselves, a sufficient undergraduate competence in technic can be attained for safety with somewhat less pressure.

A question suggested in my letter asked whether the unsettled and controversial state of the literature in periodontology acted as an obstacle to students' interest and learning in this field. Most correspondents thought this was not an important obstacle. Other departments of dentistry, notably prosthetic dentistry, are beset with no less controversy and yet the teaching does not suffer unduly. The current literature in periodontology is vigorous and is growing and becoming more scientific each year so there is no serious obstacle on that score. However, more unanimity in nomenclature and classification would be helpful.

One correspondent complained bitterly about some of the text books widely used in the schools because of a multiplicity of errors of scientific fact so blatant as to repel a careful and scientific student.

Two correspondents feel that the creation of a Board of Periodontology and the certification of specialists in this field has hurt interest in undergraduate periodontology. These correspondents feel as I do that periodontia is an essential part of the treatment of most cases in general practice to bring them to mouth health. It needs to be taught to the undergraduate student as well as operative or prosthetic dentistry, and he should be expected to practice it after he graduates, on all but a minimum of very difficult cases which he may find it advantageous to refer to one devoting himself more intensively to this field.

The foregoing covers, I think, practically all of the points made by those who replied to my questions. These answers have been extremely helpful and suggestive to me and certainly indicate where the weaknesses lie. It will now be my purpose to discuss some phases of the subject on which correspondents have only touched or which seem to me to bear especially on the problem.

Periodontal disease and its treatment is not a minor matter in dentistry.

Every study of the causes of loss of teeth shows that the vast majority of teeth are lost because of periodontal disease. It is the common experience for older people to lose all their teeth and have to wear full dentures because of breakdown of support of their natural teeth. Periodontal disease is probably the chief reason for failures in fixed bridges and partial dentures. This is because they have been designed without sufficient understanding of the requirements of the supporting tissues. Such tooth loss and failure in replacements need not be. Experience of over twenty years of my own in a single place and even longer periods of others have shown that the loss of teeth in older people is, with very few exceptions, completely unnecessary. Teeth and investing structures can be brought into health and so maintained for the patient's life time. It is possible with suitable knowledge, skill and experience so to design replacements and splinting devices that teeth are stabilized instead of being given additional strains by replacements. Loose teeth, providing detachment does not reach to the apices can usually be made firm and useful by means of periodontia treatment and prosthetic dental appliances designed with full knowledge of periodontal requirements. There is no room at present for the negative attitude of dentists and dental students towards this subject.

Criticism of the over-emphasis on restorative technics is not a plea for a great reduction in time devoted to these technics in dentistry. It takes many hours for students to learn enough of these technics to be able to make effective use of them for the purpose of creating mouth health. But the purely technical courses, even those using the patient as material to be worked on, should be over by the end of the junior year. The senior year's work in the clinic should be devoted to the primary purpose of treating people with dental troubles and problems. The student and his work should be judged on the accomplishment of that purpose. He will need to use his technics as means toward that accomplishment and will get practice in their use, but they will no longer distort his attitude toward his work, his patients and his duty to society. Periodontia as a very essential means toward his objective, will necessarily be practiced by the student and proficiency will be sought by him as in other technics in order to accomplish his purpose. With such a training in the senior year it should not take the dentist several years of practice to recognize his need for periodontal information and training.

Periodontology has made rapid strides in its status in the profession in recent years. When I graduated from dental school in 1912 there were probably 20 or 30 periodontists all together in the United States

and Canada and but two schools giving definite instruction in it. The Academy of Periodontology was organized in 1914 and the Journal of Periodontology started in 1930. Since then interest has been growing until now papers and clinics by good periodontists are as well attended as any. Many researches are going forward in the field and hundreds of graduates are taking postgraduate work to prepare themselves, some for specialization, and some because they feel the need for it in their general practice. The Curriculum Survey published in 1935 gave periodontology a secondary place as an addendum to root canal work, but insisted it should be included in the curriculum. The Council on Dental Education has also insisted that it be taught. Since then the schools have all made some effort to give some instruction in it even though no competent periodontist was available within hundreds of miles.

In the past I have been much concerned that periodontology was assigned as a part of operative dentistry, oral pathology, dental medicine, dental therapeutics or other department. I am still concerned if such an arrangement means that the subject is assigned to a department or division head who is primarily interested in something else and merely takes the chore because there is no one else to do it. Periodontology is much too important and too large a subject to be administered and taught by someone who has had so little training or experience in it that it is for him a minor interest. The administrative arrangement may vary to suit the circumstances of the school, providing the teaching staff is as carefully selected and supported as any and has as much freedom to grow and develop its field as any other teaching department of the school.

With all dental deans now showing at least nominal determination to establish teaching staffs in periodontology in their schools the matter of finding competent teachers is one of critical importance. The teacher of periodontology should be highly trained and experienced not only in the diagnosis, prevention, and treatment of periodontal disease, but he should also have a command of the sciences on which periodontology is based: oral histology, oral pathology, tissue physiology, oral microbiology, nutrition, etc. The periodontia clinic is one of the most important places for correlating basic science with clinical dentistry and the periodontia teacher is the one to point out these correlations. Furthermore, there should be a close collaboration in the diagnosis and treatment planning of cases in operative dentistry, partial denture prosthesis and orthodontics that have actual or potential periodontal pathoses. This means that periodontia instructors must have had sufficient experience in general dentistry to understand the problems and be able to cooperate effectively with teachers of other clinical departments. There should be no room

among periodontia teachers for the dentist who thinks he can go into periodontia because he is incompetent and inadequate in restorative dentistry procedures. The teachers in the periodontia clinic, almost as much as those in oral diagnosis, are the ones who should see the patient and judge his personal and dental needs as a whole, who must be able to apply all available knowledge to an understanding of the deviations from normal that are present and understand how to apply all the means and technics of dentistry to serving the needs of the patient.

The question naturally arises where such teachers are to be found. One teacher, the head of a department of dental medicine, reports writing to every dental dean in the United States and Canada for a lead to a possible full-time worker to teach periodontology and do half-time research. He obtained one possible lead, and that to a senior dental student who "thought he might be interested."

The answer to the problem lies in picking out superior students at the time of graduation and making it possible for them to get graduate or postgraduate education at institutions where competent teaching facilities exist. There just is no pool of competent trained periodontia teachers or potential teachers available at the present time. The American Board of Periodontology has certified 132 dentists up to this time as expert in the practice of periodontia. This certification, especially now that the standards of preparation and examination have been raised, assures a certain competence and superior preparation in diplomates for private practice. It is not necessarily a certification of fitness for teaching and certainly not for research, which, ideally, should be tied to teaching. Most of the 132 diplomates are older established practitioners and certainly not available as clinical instructors. Some students are now taking graduate work and long term postgraduate courses at the few institutions where satisfactory teaching facilities are available, but unfortunately for the needs in the United States many if not most such students are from foreign countries or are preparing for positions in Veteran Administration hosptials and will not be available for teaching positions in the United States. Each school, very evidently, must make determined efforts to develop teachers from among its own graduates for a long time to come although ideally many should come from other institutions.

Once get a dynamic, competent, enthusiastic teacher and research worker established and well supported, the rest is a matter of time. Even when money for adequate pay is not available many dentists will volunteer and act faithfully as clinical instructors and part-time research workers in return for the educational and professional benefits they obtain from their contact with such a teaching head and department.

Research work by members of a department or division of periodontology is an essential phase of the work of such a department. A university in its true sense is a society of scholars. In a scientific subject like periodontology a scholar must almost necessarily be a research worker in some way. There are so many questions in the field needing scientific research for an answer that a qualified worker can hardly keep himself from research if facilities are at all available. Scientific investigation is the fire from the warmth of which the enthusiasm and inspiration of the teachers is kept up. Teachers and graduate students should all be engaged in it and even postgraduates and undergraduates so far as possible. Facilities for and encouragement of research in periodontology should be an objective of every dental school as a part of the development of its teaching staff.

A comment of one of the correspondents indicated that he felt that periodontology should be pretty much postponed in the curriculum and left for postgraduate or graduate study as are orthodontics and oral surgery in some of the schools. Other correspondents indicated that they felt that the establishment of periodontology as a specialty with a certifying board was hurtful to undergraduate periodontology. This is a serious matter to me as I have been closely connected with the formation of the American Board of Periodontology and the philosophy back of it. As I said earlier in commenting on the points raised by correspondents, I believe most emphatically that periodontology can not be pushed out of the undergraduate curriculum and left for specialists if the true objective of dental practice is to be pursued. It is so intimately related to all phases of dentistry excepting the technics of exodontia and full denture prosthesis, that it is logically absurd to think of eliminating it. It should be strengthened in undergraduate practice until the technics of periodontology are as confidently and habitually practiced as any other.

The formation of the Board of Periodontology was for the purpose of certifying dentists who are expert in its practice. In the booklet of the Board there is a definite statement disclaiming any desire that those certified should limit their practice to the technics usually considered those of periodontia. Members of the Board do not feel that periodontia should in any way be separated from other phases of dental practice since all must be combined in the treatment of the patient. Since, however, so few dentists are able to recognize periodontal disease prior to its terminal stages or to treat it adequately it has become increasingly desirable to create machinery for certifying and thus identifying those who are competent in the branch. The effects of the formation of the Board have been all good so far as I can discern. Dentists who previously

looked on periodontists as charlatans have been obliged to reconsider their appraisal in the view of the development. They now recognize that there must be something in periodontology which they do not have. Educational qualifications have been established to which dentists can compare their own qualifications. The establishment of graduate and postgraduate courses of a high order has been greatly stimulated. Some hundreds of dentists are now earnestly working to qualify for certification by heavy schedules of postgraduate and graduate education, a development that would long have been delayed had the Board not opened the way.

One of the reasons why periodontia is not successfully practiced by every dentist is that it is difficult. As one correspondent points out: "I am convinced that to do a good job of subgingival curettage for a patient is a very skilled and painstaking process. Most men just aren't good enough craftsmen to do it well. It requires a great deal of patience, digital dexterity, and thoroughness of purpose and those qualities are not assembled in too many men."

I have always recognized that the technic of subgingival curettage is difficult but have never believed that it was more difficult than other technics in dentistry which every student has to learn to do well in order to graduate. I feel sure that with proper training and plenty of practice in the senior year in pursuit of the goal of a healthy mouth and teeth for each patient that the great majority of graduates will be able to be effective in their periodontia for all but a few very difficult cases.

Patient education as a phase of periodontia practice is as important for success as efficient periodontia technic. This education has a twofold purpose. One is instruction in the home care of the teeth and mouth. The other is in appreciation of the value of periodontia service to the patient. Both are essential. Yet such instruction is neglected in the education of the dental student. Were effective home care instruction to be given each patient, much less periodontia treatment would be needed and incidentally much less of the other types of dentistry. And were effective patient education given in the value of periodontal service, the difficulty regarding low remuneration for this type of service could be eliminated.

With this analysis of the reasons why periodontology teaching has not been fully effective let us not stop but proceed to aggressive action to change the conditions. To this end, I recommend:

1. That a resolution be formulated and sent to each state board of dental examiners urging that a written and practical examination in periodontology be included in the regular examination for dental license.

2. That a resolution be sent to all deans of dental schools to the effect that those schools now without competent teaching and research heads in periodontology be urged to take steps to obtain such personnel by selecting graduates of the proper potential and sending them at school expense to institutions where acceptable graduate training in the field is available. Budgetary provision should gradually be developed for adequate staff and research facilities.

3. That the deans of dental schools be urged to reorganize the whole curriculum but especially the work of the junior and senior year so that the objective of dentistry for faculty and students is made to be the welfare of the patient and the maintenance of and restoration of health, function, comfort and beauty of the mouth, jaws and natural teeth, with the technics of dentistry as a means to that end and not an end in themselves. This will carry with it a clinical arrangement by which students get to see the end results toward which their technics have been directed. It will also carry with it a routine by which every patient treated in the clinic has all indicated preventive and therapeutic periodontia treatment and such patient education as is needed for the home care of the mouth and for an appreciation and understanding of the services being rendered.

4. That the deans of dental schools be urged to organize the education of the members of the teaching staff of other departments in periodontology to the end that all teachers cooperate in presenting their teaching material as it relates to periodontal health and disease so that the widest possible information on this subject may be presented in a manner by which each department supports and augments the instruction of the other.

2. A CHANGE IN THE AIMS OF DENTAL EDUCATION

(Based Upon the Reorientation of Periodontology in the Undergraduate Dental Curriculum.)

IRVING GLICKMAN, B.S., D.M.D.,[1] *Boston*

To the objective observer, unhampered by the narcosis of custom, the American dental scene presents an inexplicable paradox. The paradox is highlighted by an inconsistency between the nature of the dental problem of the population and the teaching program designed to prepare dentists to cope with this problem. On the one hand, the observer learns that beginning with the fourth decade of life, periodontal disease is the greatest

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single cause of tooth loss.[2,3] In addition, because of a steadily increasing life expectancy, each year finds a large proportion of the population at an age level at which tooth loss is more likely to result from periodontal disease than caries.[4] On the other hand, he finds the following regarding the teaching of periodontology:[5]

(a) It occupies only 2.1 per cent of the time of the entire dental curriculum.[6]
(b) The time allotted to dental materials exceeds that devoted to periodontology.[6]
(c) Prosthodontia and operative dentistry combined receive 22.1 times the attention given to periodontology.[6]
(d) In evaluation of the quality of clinical teaching periodontology rated No. 11 on a list of 16 clinical subjects, inferior to dental ethics but on the same plane as jurisprudence.
Prosthodontia, oral surgery, and operative dentistry occupy the first, second, and fifth positions respectively in this quality evaluation.[7]
(e) In a total of 38 schools, the teaching of periodontology is ratad as follows: excellent and good, 10; fair and poor, 28. The clinical teaching of prosthodontia is rated: excellent and good, 30; fair and poor, 8. Oral Surgery: excellent and good, 23; fair and poor, 15. Operative dentistry: excellent and good, 19; fair and poor, 19.[7]

If the observer were not previously conditioned by an appreciation of the comprehensive objectives of present-day dental education, he might arrive at the following erroneous conclusions from the aforementioned facts:

(a) That we are somewhat oblivious to the existence of periodontal disease.
(b) That we are more concerned with teaching how to repair and replace teeth than how to prevent their loss.
(c) That we do not realize that the more expertly our students are taught to repair the ravages of dental caries, the more teeth will be present in people when they reach the so-called periodontal susceptible age.
(d) That we do not recognize that impressions formed in dental school mold the habits of dental practice. If the student devotes 22 times more effort to prosthetics and operative dentistry than he does to periodontology in dental school, the best that can be hoped for is that he apportion the time in his practice accordingly. However, the actuality is that periodontal care is apt to be relegated to a non-existent role because of the limited staisfaction individuals derive from activities with which they are relatively unfamiliar.

It is a fact that the provisions for periodontal training constitute the Achilles heel of the undergraduate dental curriculum. It is a most vulner-

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[2]Brekhus, P. S.: Dental Disease and Its Relation to the Loss of Human Teeth; *J.A.D.A.*, *16*, 2247; 1929.

[3]Allen, E. F.: Statistical Study of the Primary Causes of Extractions; *J.D.R.*, *23*, 453; 1944.

[4]O'Rourke, J. T.: Dental Care for Children in Relation to Geriatrics; *J.A.D.A.*, *34*, 595; 1947.

[5]The term periodontology, which generally refers to the science and study of the periodontum and periodontal diseases, will be used here in a broad sense to include the treatment of periodontal diseases.

[6]"Dental Education Today," Harlan Hoyt Horner, 1946, University of Chicago Press; p. 235.

[7]*Idem*, p. 246.

able inadequacy which unfortunately annually bears a fruit of hundreds of improperly oriented dental school graduates whose most formative years of dental practice are spent oblivious to their insufficiency in the periodontal field. Of the dental practitioners whose woeful neglect of the periodontal needs of their patients is mockingly documented in man-made replicas of the natural dentition, it may justifiably be said, "Forgive them for they know not what they do." It behooves us as dental educators, however, to deal with ourselves less charitably. Let us reshape the dental curriculum—nurtured though it has been by the sincere, unselfish efforts of conscientious educators for more than a century—it is nonetheless—a developmental anomaly—a myopic Cyclops—with fixed stare blurringly focused upon the altar of restorative art. There is a glaring need for a reorientation of periodontal teaching in the undergraduate dental curriculum, in principle and in fact. It is the purpose of this presentation to suggest directions for such reorientation.

The significance of periodontal disease as one of two major causes of tooth loss and the important role of periodontology in dentistry should be clarified for the dental student at the outset of his career in the dental school. He should be made aware of the fact that his obligations as a dentist will not be essentially confined to filling and replacing teeth. It should be made clear to him that because of the prevalence of periodontal disease, care of the supporting tissues is part of bread and butter dentistry which he should expect to manage in his practice with the same ease and confidence as filling a tooth or taking an impression. He should be made to understand that the dental school will equip him to render such care—and that his obligation to acquire proficiency in the periodontal field is just as much a prerequisite for graduation as the other major clinical requirements in the curriculm.

Everything in the dental curriculum which follows such an introduction to dentistry should leave the student with no doubt regarding its validity or sincerity. At the outset of his studies, the pertinence of the basic sciences to the clinical periodontal problem should be elucidated, as well as their relationship to other phases of clinical dentistry. Actually, periodontology offers a most opportune field for the clear-cut demonstration of the applicability of the basic sciences to clinical dentistry. It should be utilized as a much needed bridge for the gap between the basic science courses and the practice of dentistry. In no other field of dentistry are the interrelationships of local and systemic causes of disease or the clinical manifestations of pathological processes so easily apparent to student examination of the oral cavity as in periodontology. Here surely is an opportunity for dental educators to challenge the intellectual

curiosity of the most capable student and also vividly bolster dentistry's claim to recognition as a biological discipline. In this interrelationship of basic science and periodontology will the student early in his dental education sense the broad implications of his service as a dental practitioner. At this early stage, the student is confronted with tangible evidence of the potential biological scope of dentistry rather than with impressive oratory to the effect that dentistry is not merely a glorified mechanical art.

The clinical methodology and technical procedures which comprise periodontal practice should not be presented as an appendage to the curriculum usually after the student has spent a large portion of his first two years fabricating restorations for carious teeth and prosthetic replacements for missing teeth. After such an initial contact with preclinical training it would indeed be a serious indictment of existing educational processes if the student did not envision the restoration of teeth or parts of teeth as being synonymous with dentistry. Conditioned as he is with this impression, it is rather difficult for him to visualize periodontology in its real light, especially if his initial contact with it is a course in oral prophylaxis—apologetically slipped into the program—as a concession to a rather concerned periodontal department—too frequently interpreted by the student as a procedure which will help him see cavities more easily. The exposure of the dental student to oral prophylaxis in his second or even his first year is hardly a substitute for a comprehensive preclinical preparation for periodontal practice. Such an educational regime is actually an exposure without proper development—productive of a result which is consistent with the inadequacy of the technique.

The preclinical technics and methodology entailed in periodontal practice should be presented to the student concurrently with the basic technics required for the restorative branches of dentistry. (The place in the curriculum for all basic technic is a subject outside the scope of this presentation.) When he is taught the principles of cavity design and their relationship to the carious process, he should be taught the methods of periodontal treatment and their relationship to periodontal disease. When he learns to use a cutting instrument for preparing a cavity he should learn to use a curette and a scaler. At the time he learns the principles of occlusion and their relationship to dental restoration, he should learn the implications of functional forces in the periodontal field. From the contents of his preclinical training it should be obvious to the student that the major portion of the clinical practice for which he is preparing is not simply a matter of restoring teeth or parts of teeth.

The emphasis in periodontal teaching should be changed. The un-

fortunately too prevalent notion that periodontal treatment is a composite of complicated, essentially heroic attempts to tighten almost hopelessly involved teeth should be replaced by a new, mature concept of periodontal care. The latter is an approach to the maintenance of the health of all of the periodontal tissues in relation to all the teeth of all patients. The concept of periodontal care offers a constructive viewpoint to periodontal therapy instead of one of despair. It presents existing periodontal treatment technics as tools for the maintenance of the health of all the periodontal tissues rather than as spectacular steps for saving individual teeth, the retention of which too frequently serves primarily to nurture the ego of the dentist while detracting from the overall effectiveness of the individual's masticating apparatus. It is emphasis upon the latter aspect of periodontal service which has annexed the stigma of utility to periodontology in the minds of dentists and public alike.

Periodontal care should be part of the dental service to be rendered all patients instead of the need of only those with marked periodontal disease. The concept of periodontal care eliminates from the mind of the student a differentiation between periodontal patients and other types of patients. For patients without notable periodontal disease, periodontal care is a prophylactic measure; for patients with early periodontal disease, it is effective treatment for the elimination of disease and prophylaxis against tooth loss; for those with marked periodontal disease, it focuses attention upon teeth to be retained and their future usefulness rather than upon those to be lost. Above all, the concept of periodontal care inculcates a periodontal consciousness into the thinking of the student—a need for eliminating all potential causes of periodontal disease—in all patients, and caution against creating conditions which favor periodontal disease. It specifically directs his attention to a clearly defined phase of general dentistry. It impresses upon him that he is being equipped with the know-how for the maintenance of oral health, for the prevention of tooth loss—which if applied early and consistently offers a fruitful outlet for his efforts both in terms of services rendered the patient and personal gratification.

It is with the concept of periodontal care as a major phase of general dentistry as a background that the question of the time to be allotted periodontology in the undergraduate curriculum should be considered. There are four aspects to the teaching of periodontology. They are:

1. The application of basic sciences to the clinical aspects of the periodontal problem
2. The presentation of treatment methods and techniques
3. A crystallization of the interrelationship of clinical periodontology with the other branches of dentistry

4. Inculcating the periodontal viewpoint into the thinking and overall clinical practice of the student

All this requires time. If 66.92 per cent of the dental curriculum is devoted to clinical subjects, wherein does the logic lie in devoting only 2.10 per cent of this to periodontology?[8] More specifically, on what basis is the 48.62 per cent of the dental curriculum allotted to prosthodontia, operative dentistry and periodontology, divided so that periodontology receives only 2.10 per cent? The total time allotted prosthodontia, operative dentistry and periodontology (48.62 per cent) should be re-allocated so that each branch receives an equal share. The basis for such re-allocation—for some reason hitherto obscured—becomes apparent when the time hour needs of each of these activities is analyzed under the four aspects of periodontal teaching listed above. Such analysis reveals the following:

1. The application of basic science to clinical aspects of operative dentistry, prosthodontia and periodontology. In this aspect of teaching surely periodontology requires as much time as each of the other subjects.
2. The presentation of treatment methods and technics. In this phase, the so-called preclinical training, the teaching of operative dentistry and prosthodontia exceeds the time requirements of periodontology. This should be construed as an indication that the time available for the teaching of periodontal methods and technics in any way approaches adequacy under existing schedule arrangements.
3. A crystallization of the interrelationship of periodontology, operative dentistry and prosthodontia. In this phase of teaching the time requirements of each are obviously equal.
4. Inculcating the periodontal, or operative dentistry or prosthodontia viewpoint into the thinking and clinical practice of the student. It is in this phase of teaching that the needs of periodontology exceed by far the time required by operative dentistry or prosthetics. The great amount of periodontal disease that is a commonplace part of the general dental problem and the diagnostic acumen required of students to evaluate periodontal problems, are not considerations of equal magnitude in operative dentistry or prosthodontia. Superficial analysis may suggest that considerably more clinical time is required in operative dentistry and prosthodontia because these entail the mastery of a multitude of technical procedures. This is a specious argument, because it presumes that the practice of periodontology is simply the sum total of a limited number of technical procedures. It is true that the number of technical procedures entailed in periodontal practice is less than that required in the restorative subjects. However, the greater amount of periodontal care that is required for the total number of the student's patients means that he should devote more clinical time—far more than he can under existing time allotments—for periodontal management. It should be noted that in most instances these are the same patients who require restorations and prosthetic replacements, and failure to provide periodontal care jeopardizes the usefulness of prosthodontia or operative dentistry.

[8] *Idem*, p. 234.

It strikes a somewhat hollow note to teach a student the principles of periodontal treatment and then allow him only enough time to apply them for selected patients—on a restricted schedule—while he piles up a most enviable record of fillings and bridgework—in patients whose periodontal needs go unattended—because curriculum time, or monumental departmental requirements in operative dentistry and prosthodontia do not permit otherwise. Inculcating the periodontal viewpoint in the student thinking means convincing him that periodontal care is a health service which is a basic part of the general practice of dentistry, to be administered at all times it is needed and that no patient is completely cared for if his periodontal needs go unattended.

Fewer fillings and prosthetic replacements, in mouths alleviated of periodontal disease, makes sense—if these fillings and bridges are to be retained long enough to justify the effort spent on them and not become prematurely sacrificed to the ravages of periodontal disease.

Fewer fillings and prosthetic replacements in mouths alleviated of periodontal disease makes sense if we are really teaching dentistry as a health service and not as a reparative art glorified by the dignity of professional stature.

The above facts justify an equalization of the time allotments to periodontology, operative dentistry and prosthodontia. Further justification lies in the following generalizations:

1. Operative dentistry and periodontology are each concerned with a single equally significant cause of tooth loss.
2. Regardless of what opinion one holds regarding the capabilities of dental school graduates in operative dentistry and prosthodontia, there is unanimous agreement regarding their relative inadequacy in the periodontal field.
3. More attention to periodontology will ultimately be reflected in diminished prosthetic needs of the population.

It should be apparent that periodontology belongs to the very cloth from which dental education is cut. It is one of many fibres which form the cloth. It must be properly integrated with the other fibres which constitute the dental school curriculum. Its quantity should be sufficient to supply strength. Its quality should be of such a calibre as to enhance rather than detract from the finished weave. Its arrangement should afford the benefits of continuity rather than the confusion and consternation of incoherent loose ends. Its distribution should be such as to subtly influence the overall pattern, rather than disconcert the eye as a bizarre isolated entity. Above all, it must constitute an inherent component of the finished product—not tacked on as an ornament, dependent upon the whim of individual designers for its very existence,

proportions and position—without being properly utilized so as to significantly contribute to the basic purposes for which the entire garment is created.

To accomplish these ends, the time allotted to operative dentistry, prosthodontia and periodontology within the existing framework of the dental curriculum must be equalized.

This presentation is not simply a request for increasing the time allotted periodontology in the undergraduate curriculum. It is not merely another special group in the dental faculty that wants a little more attention. This is instead a suggestion that the philosophy which has motivated the present distribution of curriculum time be drastically altered—that within the existing framework of the dental curriculum—the time allotments be reorganized, and that such a reorganization should constitute a true reflection of shift in viewpoint of dental education. The need for a quantitative adjustment in the time devoted to periodontology is imperative—however, it is far more significant in the development of dental education that the full implications of such reorganization be crystallized, first in the minds of the faculty, then in the thinking of the students and ultimately in the general practice of dentistry.

The question of whether periodontology should be taught in a separate department is not a particularly important one. More vital is the question, Under what arrangement can periodontology be taught most effectively? If the organization of individual institutions is such that departmentalization is required for effective teaching, then a separate department of periodontology should be established. However, if placing periodontology in a separate department means isolating it from the remainder of the clinical services, then such departmentalization is to be discouraged.

Periodontology constitutes an important integral part of the undergraduate curriculum. To the degree that is necessary to establish it as such, periodontology should be stressed. But not if such stress carries with it even the vaguest suggestion of an intellectual possessiveness. Fundamental information regarding the oral tissues is not the vested interest of any one department. Nor is there any one branch of modern dentistry which has been or should presume to be the fountain source of knowledge from which all information is derived and upon which all other departments should depend for fundamental principles of clinical practice.

Such a presumptiveness on the part of any department fosters an antagonism which is most detrimental to the teaching of dentistry as an integrated health service. It would relegate periodontal teaching to the role of a cloistered authority in the dental school to be referred to only when needed. It is incompatible with the best interest of dentistry as a

whole if periodontal departments develop behind an insurmountable barrier of aloofness. The histopathology of the periodontal tissues is as much the property of the orthodontist or prosthodontist as it is the realm of the periodontist. Virchow, whose contributions in the field of bone pathology are basic to many branches of clinical dentistry, was neither a prosthodontist, periodontist, or orthodontist. It is imperative for the periodontal activity of the dental school to identify itself with the general dental service of the school—not as a monitor of the efforts of other departments but as another major division of general dentistry.

Excellence in the teaching of periodontology should be the aim of teachers charged with this responsibility. However, the real effectiveness of any periodontal teaching lies in the degree to which the periodontal viewpoint diffuses through the thinking of the entire faculty and student body alike. In the final analysis, it is the latter influence which will effect the much needed change in the philosophy of American dentistry.

Insistence that all periodontal treatment be performed within the confines of an isolated periodontal clinic is an undesirable development in dental education. It is inconsistent with the nature of the periodontal problem and with the prevalence of periodontal disease as a clinical problem in general dentistry. In the minds of the student, it tends to segregate the periodontal treatment of the patient from the other dental procedures with which it is so intimately related. It thereby detracts from the wholeness of dental care. It creates an artificial inconvenience which may act as an obstacle for rendering periodontal care when it is needed in the course of total treatment. Insistence that all periodontal treatment be done within the confines of a periodontal clinic fosters departmental nationalism and tribal jealousies which are detrimental to the unhampered interchange of clinical philosophies. At best, continued isolation of the periodontal treatment of patients from the remainder of their dental care and persistent efforts to build bigger and better isolated periodontal clinics in dental schools constitute unwitting progress in a direction contrary to the best interests of the dental institution and even in the long run the best interests of the periodontal teacher. It strikes a peculiar note when one insists that the periodontal problem is one of the two major problems in dentistry and then insists that it be treated separately from the remainder of dentistry. Periodontology is an integral part of general dentistry and there is no reason why it should be segregated from general dental care.

There is no question that many procedures in periodontology are best taught in small groups removed from the distraction of other clinical activities. In the early stages of periodontal training, diagnosis, scaling,

curettage, equilibration and later gingivectomy should be taught within the privacy of a separate clinic where all necessary teaching needs are gathered. However, once the basic technics are mastered, and become part of the mental equipment of the student, they should be performed for all patients when they are needed just as will be done when the student becomes a practitioner of dentistry. After receiving his basic clinical training in periodontology, opportunity should be provided for the student to render periodontal service at any school session he is in the clinic, at any chair he may be using on the clinic floor. Instruction from the periodontal department should be available whenever the general school clinic is open. The culmination of the efforts of the periodontal teacher lies in more of the students rendering more periodontal care to more of his patients rather than the expansiveness of isolated periodontal clinics.

The establishment of periodontology as a specialty and the specification of postgraduate educational requirements for improvement of the calibre of experts in this field should be a stimulus to improved undergraduate periodontal teaching. The existence of a small group of dentists who desire to limit their practices or specialize in periodontia cannot be hailed as a sign that the obligation of the undergraduate curriculum in the periodontal field is diminished. If anything, the opposite is true. The existence of individuals with a primary interest in cardiology who limit their practices accordingly has not meant that medical schools have diminished their teaching of the anatomy and physiology of the heart and the diagnosis and management of cardiac dysfunction—or that medical practitioners have thrown away their stethoscopes.

The periodontal care of the American public is today and will continue to be primarily the concern of the practitioner of general dentistry. Any influences brought to bear upon dentists which is contrary to this concept is detrimental to the dental health of the public. There will always be a place for the specialist in the periodontal field—and the enlightenment of general practitioners as to their own responsibilities in the periodontal care of all their patients will serve to secure and expand the role of the specialist. The practitioner of general dentistry is not to be cultivated or trained to be an individual who knows enough about periodontal disease—not to treat it. He should know enough to handle most periodontal problems which confront him and the availability of a well trained group of specialists for unusual problems should serve to supplement the dental care available to our population. It is hardly complimentary to the recognized expert in the periodontal field if it is presumed that all cases of periodontal disease, regardless of their severity or complexity, comprise adequate challenges for his talents. It is equally

economically unsound to utilize highly trained postgraduate products to cope with problems which can be managed by dental school graduates.

The interest in periodontology on the part of the general practitioner is a real one—prompted in part by his appreciation of an inability to cope with the daily problems that confront him and in part by the attention attracted to periodontology by the pioneering efforts of the American Academy of Periodontology. Out of a group of 914 registrants who participated in postgraduate refresher courses representing 13 subjects over a five-year period at Tufts College Dental School, 21 per cent selected periodontology. These are dentists interested in the practice of general dentistry, not candidates for certification as specialist. Certainly their voluuntary expression of inadequacy in this branch of general dentistry should constitute a clarion call for improved undergraduate teaching in periodontology.

Expanding interest in periodontology as a specialty should and will exert a salutory influence upon the concern of the dental student regarding periodontal problems and upon improved undergraduate training. Likewise—better undergraduate teaching will ultimately improve the calibre of the certified expert, first by providing better candidates for postgraduate training—second by developing a pool of teachers at the undergraduate level who may be utilized for postgraduate teaching—and third by fostering a more critical approach to the standards of all periodontal teaching. The establishment of periodontology as a specialty and continued improvement in undergraduate periodontal teaching are interdependent movements—mutually dependent upon each other for continued stimulation and progress.

In conclusion, this evaluation of the role of periodontology in the undergraduate dental curriculum is not fundamentally a request for more time for periodontal teaching or for bigger and better periodontal clinics in dental schools. It is not a request that periodontology be recognized as a more important specialty of dentistry. It is not a request to make periodontology a bigger satellite in the orbit of restorative dentistry. In fact, it is not a request that anything be done for periodontology. It is instead a request that something be done for dentistry. It is a request that the emphasis in the dental curriculum be changed—that dental educators take cognizance of the fact that care of the supporting structures is just as important a part of general dentistry as restoring teeth or parts of teeth and that because of a glaring inadequacy in the existing curricula of the American dental schools, this care of the supporting structures has been neglected and the dental health of the public has suffered accordingly.

This is a request that the entire philosophy of dental education be changed so that ultimately the general practice of dentistry which reflects the pattern of dental education will actually become the well-rounded health service it should be. The following specific suggestions have been offered whereby dental education can effect changes in the necessary direction:

That with his introduction to dentistry, the dental student is made fully aware of the significance of the periodontal problem as a major cause of tooth loss. That from the outset of his career in the dental school his training is so oriented that it is obvious to the dental student that the general practice of dentistry is equally a matter of care of the periodontal tissues as it is one of tooth repair and replacement.

That preclinical periodontal training be integrated with and taught simultaneously with preclinical training for prosthodontia and operative dentistry.

That the old notion that periodontal treatment is an heroic attempt to salvage markedly involved teeth in a few patients be replaced by a new concept of periodontal care which provides for the maintenance of the periodontal health in relation to all teeth, for all patients.

That the time allotted periodontology, operative dentistry, and prosthodontia in the dental curriculum be equalized.

That it shall be possible and necessary for dental students to render necessary periodontal service in the general dental school clinic at all clinical sessions.

That for all patients, complete dental service will not be measured in terms of the completed restoration of teeth or parts of teeth, but will include all necessary periodontal care.

It is hoped that our dental institutions which have been entrusted with the responsibility for training dentists prove themselves worthy of this trust by having the vision and courage to break from the hampering tradition of continued subservience to the restorative arts and embark on an educational program which is consistent with the real nature of the dental problem of the population.

COLLEGE NEWS

Edited by SIDNEY EPSTEIN, D.D.S., *San Francisco*

University of Buffalo:

ANNOUNCEMENTS

The University announces the appointment of Dr. T. Raymond McConnell, formerly of the University of Minnesota, as chancellor of the University.

Upon the resignation of Dr. Russell W. Groh, Dr. Leon J. Gauchat was appointed dean.

Dr. S. Howard Payne, member, American Board of Prosthetic Dentistry, and a Fellow of the Academy of Denture Prosthesis, has been appointed assistant dean. He is professor, prosthetic dentistry, in the school.

Dr. Russell W. Groh, former dean, has been appointed head of the dental division, Veterans' Hospital, Buffalo. Two other members of the faculty joined him: Drs. Edward Mehringer and Sheldon Koepf.

Dr. Hugh Quinby has been appointed lecturer in partial denture prosthesis and Dr. Allan Gibbons instructor in the prosthetic infirmary.

Creighton University:

ANNOUNCEMENT

Dr. Joseph A. Gibilisco, director of research.

Emory University:

ANNOUNCEMENTS

Dean Buhler announces the presentation of two "Zip" awards. These are the first of such awards to be made in the name of Xi Psi Phi fraternity, one an engraved plaque presented by Dr. Ralph H. Aiken, a former national president of the fraternity, was won by George Hartley, a freshman student, Delta Sigma Delta fraternity, for the highest scholastic average; the other, a certificate, was won by Quinoc Davis for the highest freshman average in the Xi Psi Phi fraternity.

Howard University:

PROMOTIONS

Dr. Carnot C. Evans, professor of orthodontics and superintendent of clinics, now head of the department of orthodontics.

Dr. Kwan Boo Park, instructor, operative dentistry, to assistant professor, operative dentistry.

Mrs. Alicia M. Howard, assistant professor, oral hygiene, to director, department of oral hygiene.

APPOINTMENTS

Charles E. P. Jupiter, D.D.S., instructor, pedodontia.

Theodore A. Shell, B.S., D.D.S., instructor, operative dentistry.

Henry W. Deutsch, D.D.S., instructor, prosthodontia.

Sidney Burnett, D.D.S., instructor, prosthodontia.

Earl E. Ware, B.S., D.D.S., instructor, oral medicine.

Wendell H. Butler, D.D.S., instructor, oral surgery.

Leonard A. Altemus, D.D.S., instructor, orthodontia.

CURRICULUM

Pedodontia Technique and Laboratory (new), under direction of Drs. Charles E. Jupiter and Frederick S. Perry.

RESEARCH

Doctors Raymond L. Hayes, department, oral medicine, and Walter Booke, pharmacology, third year, study of "Relationship of Vitamin C to Periodontal Diseases," under a grant by the United States Public Health Service.

LEAVES OF ABSENCE

Joseph L. Henry, D.D.S., M.D., Sc., now working for his Ph.D. degree, for University of Illinois.

Dr. Garrett V. Ridgley, instructor, prosthodontia, for graduate study at University of Michigan.

Dr. Coleman R. Tuckson, instructor, oral surgery, for graduate study in roentgenology at University of Pennsylvania.

University of Illinois:

ANNOUNCEMENT

Dr. Bernard G. Sarnat, professor, oral and maxillo-facial surgery, has been named recipient of the Kerbs award in plastic surgery, presented by the American Society of Plastic and Reconstructive Surgery.

University of Nebraska:

ANNOUNCEMENT

In sorrow, the University announces the passing of one widely known within the profession, Dr. W. Clyde Davis. (An obituary will appear elsewhere in this journal.)

University of Kansas City:

APPOINTMENTS

Philip M. Jones, D.D.S., professor, dental prosthesis.

John Ennever, D.D.S., assistant professor, bacteriology and research.

Joseph F. Jacobs, D.D.S., chairman, department of periodontology.

Delvin K. Dimick, D.D.S., instructor, operative dentistry.

Charles Hart, D.D.S., instructor, operative dentistry.

Joseph J. Imoehl, D.D.S., assistant instructor, crown and bridge prosthesis.

Arthur Lindquist, D.D.S., assistant instructor, prosthetic dentistry.

Charles J. Brown, D.D.S., clinical instructor, oral surgery.

Guy W. Dennis, D.D.S., instructor, oral diagnosis.

Walter R. Loudon, D.D.S., and Fred C. Byers, D.D.S., instructors, freshman technic.

Willard R. Belling, D.D.S., Assistant State Health Director, special lecturer, public health.

Loyola University (Chicago):

ANNOUNCEMENTS

Dr. A. Raymond Baralt, the new dean, presided over the 68th opening exercises of the school Monday evening, September 25th.

Dr. Harold W. Oppice, professor, fixed crown and bridge prosthesis and president-elect of the American Dental Association, delivered the faculty address.

Medical College of Virginia:

Announcement is made of the death of the dean, Harry Baer. (An obituary will appear elsewhere in the journal.)

University of Michigan:

ANNOUNCEMENTS

The new dean, Dr. Paul H. Jeserich, presided for the first time over the annual opening convocation, September 25th. Dr. Joseph Bernier, Georgetown University, School of Dentistry, and the Armed Forces Institute of Pathology, was the principal speaker.

Dr. William R. Mann assumes full-time duties, operative dentistry and assistant director, W. K. Kellogg Foundation Institute.

Dr. Sigurd Ramfjord, Oslo, Norway, full-time assistant professor, periodontia.

New York University:

ANNOUNCEMENTS

Dr. Charles G. Darlington, professor of pathology, and Dr. Eli G. Goldsmith, research coordinator, are devoting time to cancer teaching conferences.

Interest in the air-dent abrasive technic has greatly increased to the extent that we now have over 300 applicants for instruction.

Northwestern University:

APPOINTMENTS

Quentin Blackwell, D.D.S., instructor in chemistry.

Gerardo N. Aste, D.D.S., partial denture prosthesis.

Andreas Dahl, D.D.S., instructor, pedodontia.

Martin Cattoni, D.D.S., instructor, oral pathology.

Rolf Enersen, D.D.S., instructor, operative dentistry.

FELLOWSHIPS

Graduate fellowships have been announced in the following: oral surgery, periodontia, pedodontia and prosthetic dentistry.

University of North Carolina:

ANNOUNCEMENT

The new dean, Dr. Brauer, announces activities of immediate interest in the development of the school.

Ohio State University:

ANNOUNCEMENT

Announcement is made of eight graduate courses in different fields of dentistry plus one five-day course in air-brasive theory and technic.

University of Pennsylvania:

APPOINTMENTS

Paul Boyle, D.D.S., committee on pathology, national research council.

ANNOUNCEMENTS

Dean Appleton announced the regular committee appointments for the academic year 1950-51. He also announced receipt of the diploma of Dr. Frederick McKay, 1900, one of the first to recognize and describe mottled enamel.

Temple University:

Announcement is made of a number of graduate courses under direction of Louis Herman, professor, oral anatomy.

OBITUARY

Three men well known within the profession and well respected, both over the country as a whole, and especially within their own communities, have recently passed away:

Dr. W. Clyde Davis, known as a pioneer in Nebraska University. He was a founder of the school, which in 1899 became a part of the university. He served as dean and professor of operative surgery until 1922. Dr. Davis served his profession in many ways, including a textbook on "Operative Dentistry."

✚ ✚ ✚

Dr. Harry Bear was dean of the dental school, Medical College of Virginia, and professor of oral surgery.

✚ ✚ ✚

Dr. R. D. Dean came to the University of Tennessee, College of Dentistry, in 1922 as part time professor of oral pathology. He became head of that division in 1933. He served as dean of the college from 1941 until his recent retirement in 1950.

BOOK ANNOUNCEMENTS

Operative Dentistry. This is a new edition of a standard text, completely revised and rewritten. The original text has been known for many years under the authorship of William H. O. McGehee, D.D.S., M.D., formerly Professor of Operative Dentistry, College of Dentistry, New York University. The present volume, revised, is by Harry A. True, D.D.S., Professor of Operative Dentistry, and E. Frank Inskipp, B.S., D.D.S., Assistant Clinical Professor of Operative Dentistry, both of the College of Physicians and Surgeons, a School of Dentistry, San Francisco.

It consists of 699 pages, including an index and 479 illustrations. It is well bound, printed on good stock and presents an altogether attractive appearance. The quality of the book is attested by the previously well known edition and the abilities of the present authors.

Published by Blakiston Company, Philadelphia 5, Penna. Price $10.00.

Oral Pathology. This is the third edition of this well known book by the equally well known author, Kurt H. Thoma, D.M.D. This author is well known as Professor of Oral Surgery, Harvard University Dental School, and as the recipient of many honors, honorary degrees and professional connections and associations. It consists of 1592 pages with an index and 1660 illustrations, including 78 in color.

Published by C. V. Mosby, Co., St. Louis. Price $17.50.

Caries Research. This is a bibliography on caries research, prepared and issued by the Associate Committee on Dental Research of the National Research Council of Canada, edited by J. Stanley Bagnall, D.D.S., F.D.S.R.C.S., Ottawa.

This is a book of 557 pages, with a bibliography of 2274 references. It is well printed in offset printing, well bound and should serve a useful purpose among researchers and any interested in knowing the authorities in the study of the cause of dental caries. It is a worthwhile reminder of the advances made in dental research during the past quarter of a century or more, although it covers the literature from 1890 to 1949. It is evidence, *per se*, of the development of the dental profession, and is a credit to the Canadian Dental Association as well as those immediately involved in its production.

It contains a description of the committee and its objects; a foreword by the chairman, Dr. Roy G. Ellis, Dean, Faculty of Dentistry, University of Toronto; and introduction, and a table of contents. It is a job well done.

Published by The National Research Council, Ottawa, Canada. Price, $10.00.

Paradentitis und Paradontose: Leitfaden der Zahnbetterkrankungen. Von Prof. Dr. Ewald Harndt. 186 Seiten mit 291 Abbildungen. Format 17 x 24.5 cm. München 1950, Carl Hansen Verlag. Kartoniert 17.80 DM. (This is the title of a monograph, paper binding, 186 pages, including an index, and well illustrated. It is published by Carl Hansen Verlag. Price, 17.80 DM. Ed.)

Genese und Prophylaxe der Karies: Vorträge der wissenschaftlichen Tagung der Deutschen Gesellschaft für Zahn-, Mund- und Kieferheilkunde vom 28.-31. Juli 1949 in Wiesbaden. Erster Teil. (Zahn-, Mund- und Keiferheilkunde in Vorträgen, Heft 4). 150 Seiten mit 117 Abbildungen. Format 17 x 24.5 cm. München 1950. Carl Hansen Verlag. Preis kartoniert, 16.80 DM., für Abonnenten auf die Schriftenreihe 15.12 DM. (This is the title of another monograph, paper binding, 150 pages, well illustrated, published by Carl Hansen Verlag. Ed.)

Advice to Teachers[1]

"If you want to make a particular impression on your students, you should require them all to read something in an article or book which is in short supply or not even available at the college library.

"*Low down.* When you are lecturing, it is also a good idea to remain seated. If you lower your voice to a barely audible level, it will help to keep the students alert. If you do happen to have any notes, keep your head down and your eyes fixed on the notes rather than on the class. But when the final bell rings, pay no attention to it; keep on lecturing for a minute or two longer.

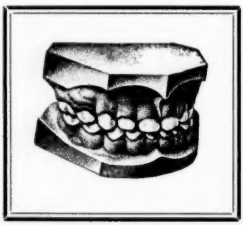
"*Hm-m-m.* One useful device for adding to one's own status is to cut down the stature of your colleagues in the students' eyes. Capitalize upon any errors they may have made, especially in such discriminate items as their use of punctuation in the footnotes of bibliographies in their books and articles. One most effective way to undermine the standing of colleagues is to affect shocked surprise when a student cites another instructor. Just raise your eyebrows, and say, with the proper emphasis, 'Did Professor Jones say that?'

"Sometimes students may object to the mark which is given them on a test question. You should rebuke any such objection as an attack on your personal integrity and professional competence. This attitude will serve to discourage most complaints. If some persist, however, use only the simplest logic with them. With an air of great and long suffering patience, say for instance, 'This mark is a C because your answer isn't good enough to be a B. If it were a B it would be better than a C, but it isn't, see?' This will usually stop them dead in their tracks.

"*All knowing.* Confine your reading—and your conversation—to a narrow segment of your field. It will mark you as a man of consequence if you can always be depended upon to make appropriate remarks about Keyne's interpretation of Fisher's theory of the M prime as an economic absolute, for instance. Be an example of the fact that the true scholar regards anything outside his own field as unworthy of consideration."

[1]Horace T. Morse, Dean of the University of Minnesota, General College, *Pathfinder*, July 26, 1950, pages 42, 43.

2 Outstanding Contributions to Dental Education and Practice



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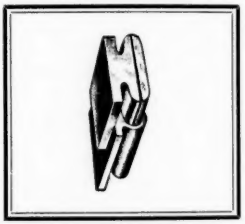

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